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XII

THE FAUNAL AREAS OF SOUTHERN ARIZONA: A STUDY IN ANIMAL DISTRIBUTION

BY

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INTRODUCTION

During the summer of 1927 the Department of Ornithology and Mammalogy of the California Academy of Sciences conducted three field trips to southeastern Arizona. The region visited comprised the lowlands surrounding the Santa Rita Mountains, from 30 to 60 miles southeast of Tucson and a short distance north of the United States-Mexico boundary line. Personnel and itineraries of the three parties were as follows: H. S. Swarth and Joseph Mailliard, with Raymond Gilmore as assistant, left San Francisco by automobile on May 6, arriving at Patagonia, Santa Cruz County, Arizona, on May 10. There we were joined by David M. Gorsuch, who remained with us throughout our stay, as a volunteer aid. With Patagonia as a center, collecting was carried on along the eastern base of the Santa Rita Mountains and some distance to the eastward, from May 10 to June 2. Camp was then shifted to the western base of the Santa Ritas, near the Florida Ranger Station, at the mouth of Stone Cabin Cañon, where we remained from June 2 to 21. Return to San Francisco was accomplished on June 25.

Joseph Mailliard, with Floyd C. Rankin as assistant, left San Francisco by automobile on August 23 and arrived at Patagonia on August 27. They left Patagonia on October 13, reaching home on October 17. Miss Mary E. McLellan, travelling by train from San Francisco to Tucson, collected in Madera Cañon, on the west side of the Santa Rita Mountains, September 3 to October 13. Mr. Sam Davidson was a volunteer aid in collecting mammals during part of that time. Specimens collected upon all three trips include 1127 birds and 423 mammals.

For necessary permits to carry on the collecting of the above mentioned material we were indebted to the courtesy of the Arizona Fish and Game Department, through Mr. D. E. Pettis, State Game Warden. We are also under great obligations to Mr. Marshall Ashburn for permission to camp upon and to hunt over the extensive Ashburn Ranch (formerly the Pennsylvania Ranch) in the Sonoita Valley.

In pursuing the study of this collection I have found it necessary to call upon various institutions and individuals for the loan of specimens and for information, all of which was most generously granted. I am under obligations for such help to Dr. Alexander Wetmore, Assistant Secretary of the Smithsonian Institution, who authorized the loan to me of numerous specimens from the collection of the United States National Museum, including the type of *Agelaius phœniceus sonoriensis*; to Dr. Charles W. Richmond for advice upon various subjects and for specific information regarding the above mentioned type specimen; and to Mr. Gerrit S. Miller, Jr., for identification of the specimens of *Myotis* we collected. To Mr. Paul G. Redington, Chief of the Bureau of Biological Survey, I am indebted for the loan of specimens and for permission to use unpublished data from the files of the Survey bearing upon the distribution of certain species of *Citellus* and *Ammospermophilus* in Arizona; and to Major E. A. Goldman, of the same Bureau, I am indebted for the identification of specimens of *Perognathus, Dipodomys,* and *Sigmodon,* and for information regarding other species. From the Museum of Vertebrate Zoology of the University of California, through Dr. J. Grinnell, Director, I received the loan of specimens whenever they were desired, and facilities for working at the

Museum whenever I chose to do so. From the Museum of Comparative Zoology, through Mr. Outram Bangs, I was permitted to borrow a series of skins of *Sayornis nigricans*. From the Field Museum of Natural History, and from the Museum of Leland Stanford, Jr., University, I also received the loan of specimens. From Dr. L. B. Bishop I received the loan of specimens, including an important series of *Agelaius*, and data upon many Arizona-taken bird skins in his collection. The half-tones illustrating this report are all from photographs taken by Mr. Joseph Mailliard. Mrs. Mary McLellan Davidson, Assistant Curator of the Department of Ornithology in this institution, drew the distribution maps and rendered important help also in other ways.

In the following accounts of the species of birds and mammals collected I have for the most part limited my remarks to statements bearing upon distribution. Facts pertaining to nesting or other activities have been omitted in most cases where the species concerned is more or less well known. They have been included in a few cases where it seemed worth while, and, also, data pertaining to migration and molt in birds have been briefly presented, in the belief that these facts were worth placing upon record.

The Region Visited and the Problem Involved

Our field work in southeastern Arizona was primarily for the purpose of studying the local distribution of animal life in the section visited, which comprised the lowlands surrounding the Santa Rita Mountains. Years ago the writer had collected birds extensively and mammals in lesser numbers in that general region, and he had been struck by certain outstanding features in the delimitation of species there. The opportunity now presented itself of acquiring further data on the subject, and field work was pushed accordingly with the object of gathering specimens and information that would bear upon the distribution of lowland forms. The several mountain ranges of southern Arizona rise much like islands from a surrounding sea of plains. Their bird and mammal faunas are peculiar and are sharply differentiated from those of the surrounding lowlands, but

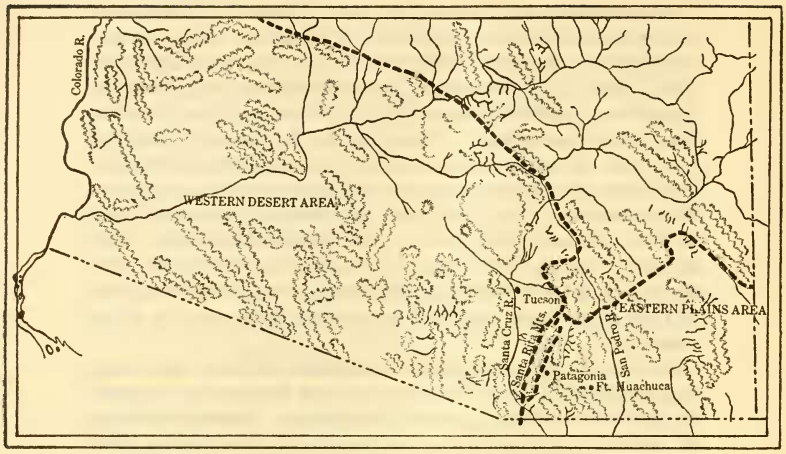

Fig. A. Map of southern Arizona, showing region studied and localities visited by the California Academy of Sciences expeditions of 1927. Broken lines indicate approximate boundaries of Western Desert Area and Eastern Plains Area.

they are quite well known and in any event have no bearing upon the peculiar differentiation of faunas that distinguishes different lowland areas. So, while the Santa Rita Mountains, as a conspicuous boundary line between two lowland differentiation areas, formed a center for our field work, and were even, perforce (through lack of camping facilities elsewhere), the site of our base camps for work on their west side, little attention was paid to the typically high zone species of birds and mammals, and only one or two brief trips were made to high altitudes.

In southern Arizona, from the Colorado River on the west, east to the Santa Rita Mountains, the general appearance of the lowlands is everywhere about the same. Except for limited areas along the river bottoms it is desert of the most arid type, covered with a fairly dense growth of desert plants, a chaparral composed of many different shrubs, bushes and cactuses. This chaparral, as in desert regions elsewhere, is in the shape of isolated clumps of vegetation of

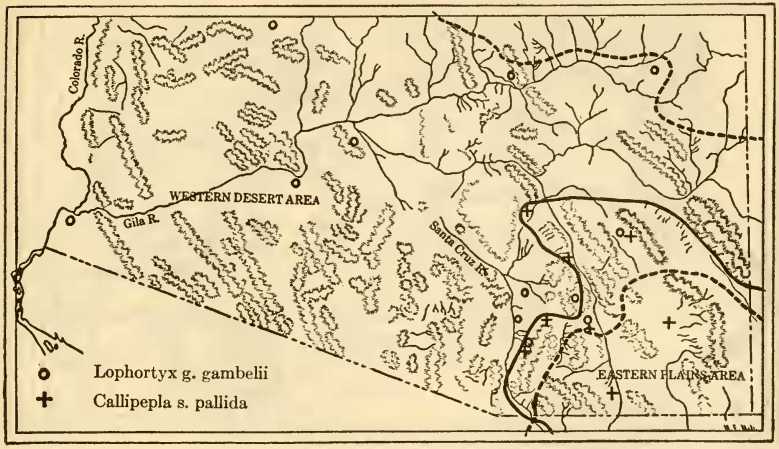

Fig. B. Map showing distribution in southern Arizona of *Lophortyx gambelii gambelii* and *Callipepla squamata pallida*. Symbols indicate published record stations; broken line indicates approximate northern and southeastern boundaries of *L. g. gambelii;* solid line indicates approximate northern and western boundary of *C. s. pallida*.

greater or less extent, separated by areas of bare ground. Cactus of several species are important plants, there being thickets of low-growing cholla almost everywhere, and in places scattered individuals or extensive "forests" of the tall and conspicuous giant cactus. The cactus plants are an important factor in the economics of birds and mammals, so much so that the very existence of several bird species in a region is dependent upon the presence of the giant cactus. The few river beds are marked by rows of tall cottonwoods, with a lesser growth of willows and arrow-weed, the latter sometimes forming dense jungles of considerable extent. Mesquite, catclaw, ocotilla and the creosote bush are all present in abundance, and each occurs in almost pure stands over large areas, and there are many other species of trees and bushes that enter into the composition of the plant covering of this area. It is desert, but well covered with shrubby or tree-like vegetation. There is relatively little grass anywhere.

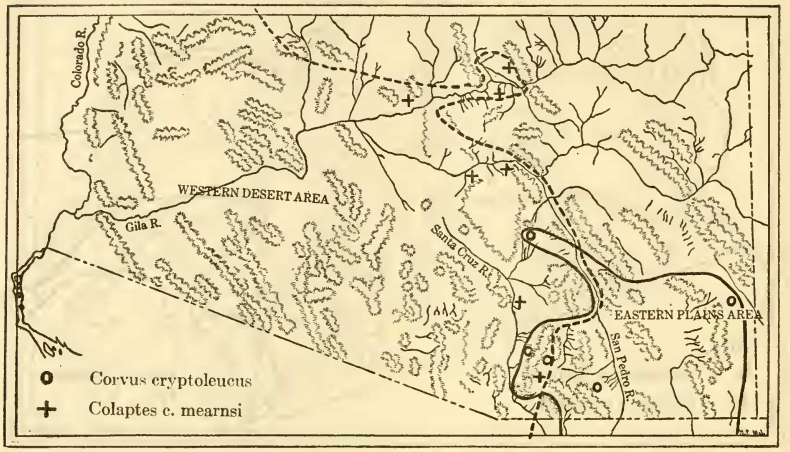

Fig. C. Map showing distribution in southern Arizona of *Colaptes chrysoides mearnsi* and *Corvus cryptoleucus*. Symbols indicate published record stations; broken line indicates approximate northern and eastern boundaries of *Colaptes c. mearnsi;* solid line indicates approximate northern and western limits of *Corvus cryptoleucus*.

East of the Santa Rita Mountains is an entirely different sort of region, and the transition from one to the other is abrupt. Desert chaparral is there replaced by grassy plains. In some rocky foothill sections there may be found small tracts of "brush" or a few scattered cholla cactuses, and in places there are extensive stands of creosote, but for the most part there are illimitable stretches of rolling hills or gently sloping plains covered with grass and with almost nothing else. In some low-lying swales the shorter prairie ("grama") grass is replaced by growths of "sacaton," a coarse bunch grass eight or ten feet high. In parts of the foothill country tree yuccas form the most conspicuous plant growth, and there are places on the grassy plains where small mesquites cover many miles, spaced so regularly and so uniformly of a size as to give the impression of a young peach orchard.

In the western desert area the elevation of the lowlands

rises from a little less than 100 feet above sea level on the lower Colorado River to nearly 4,000 feet at the western base of the Santa Rita Mountains. On the eastern grassy plains the average elevation is probably between 4,200 and 5,000 feet. From the south-central portion of Arizona southward and westward and along the western border the summers are long and intensely hot, while the winters are mild. In the southeast the heat of summer is not so intense and the winters are somewhat colder. The annual mean temperature at Tucson is 68° Fahrenheit, at Fort Huachuca, 61°.

Table of Temperatures in the Western Desert Region (at Tucson) and in the Eastern Plains Region (at Fort Huachuca)

	WINTER			SPRING			SUMMER			FALL		
	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean
	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F
Tucson.....	10	90	52	22	106	66	40	112	85	21	107	70
Fort Huachuca..	0	79	45	16	97	60	37	104	77	15	99	63

There is considerable difference in the rainfall and humidity of the two regions. The valley of the Colorado in southwestern Arizona, with an annual rainfall of less than three inches, represents the extreme conditions as to aridity in the United States. Such conditions prevail along the southern boundary of Arizona eastward over most of Pima County, but in the eastern portion of that county, as the higher mountains are approached, the precipitation increases, the average annual rainfall at Tucson being 9.8 inches. Farther east it becomes still higher, being 16.2 inches at Fort Huachuca.*

It is thus seen that the two sections of southern Arizona that are contrasted in the present study (the boundary line between indicated by the Santa Rita Mountains) present certain slight differences of altitude, of temperature, and of rainfall, that are correlated with different types of vegeta-

*The meteorologic data cited is taken from *Climatology of the United States*, by A. J. Henry (U. S. Dept. Agric., Weather Bureau, Bull. 2, 1906), in which publication see also plate XXVI, showing normal annual precipitation in the United States.

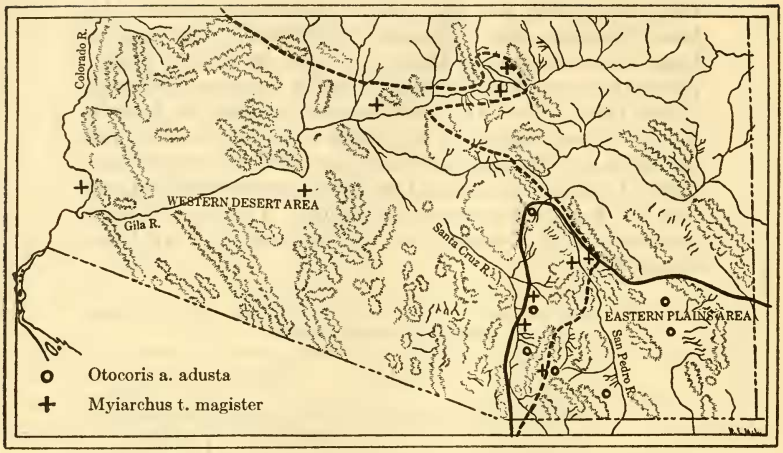

Fig. D. Map showing distribution in southern Arizona of *Myiarchus tyrannulus magister* and *Otocoris alpestris adusta*. Symbols indicate published record stations; broken line indicates approximate northern and eastern boundaries of *Myiarchus t. magister;* solid line indicates approximate boundaries of *Otocoris a. adusta.*

tion and with well marked differences in the faunas of the two regions. To define the two as occupying different life zones, the western Lower Sonoran, the eastern Upper Sonoran, does not seem satisfactory. The western section is, of course, emphatically Lower Sonoran in every respect. The eastern section is slightly higher altitudinally, of slightly greater rainfall, and of slightly lower temperature, and may be conceded to present some Upper Sonoran aspects. At the same time, wherever the eastern grassy plains are invaded by limited growths of shrubs, bushes, or trees, these are in most cases Lower Sonoran desert species, such as mesquite, cholla cactus, ocotilla, etc. In the mountains of this section the foothill regions immediately above the plains possess characteristic Upper Sonoran assemblages of plants and animals which do not descend any lower. In some parts of the plains there are limited numbers of characteristic Lower Sonoran desert birds (Scaled Quail, White-

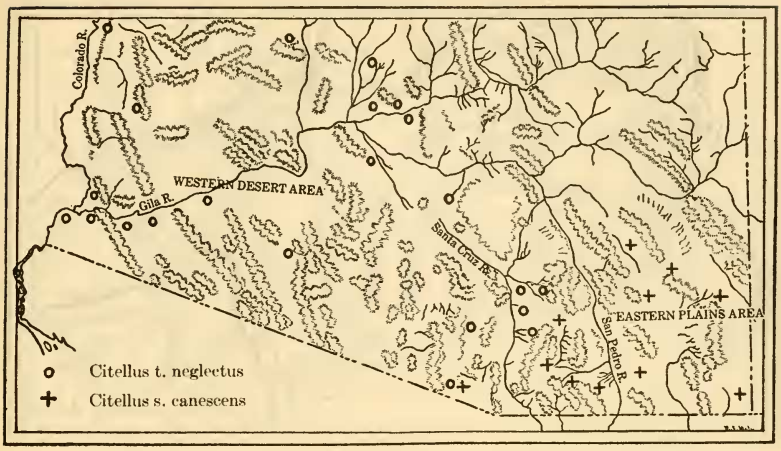

Fig. E. Map showing distribution in southern Arizona of *Citellus tereticaudus neglectus* and *C. spilosoma canescens*. Symbols indicate record stations, mostly from hitherto unpublished data supplied by the United States Bureau of Biological Survey.

winged Dove, Phainopepla, Vermilion Flycatcher, and others) and mammals (species of *Peromyscus*, *Onychomys*, *Lepus*, and others) associated with such species as the Prong-horn, Prairie Dog, Horned Lark, and others, that occur elsewhere in Upper Sonoran and higher.

The two sections, on the whole, do not seem to me to show differences of life zones in their contrasting characteristics, but to be comparable rather to the "faunal areas" described by Grinnell (1915, pp. 9-12) in his treatment of the distribution of birds in California. The extreme southeastern corner of Arizona appears to be definable as a faunal area distinct from the regions to the westward and to the northward. The western boundary of this faunal area is the subject of the present study. Of the boundary line elsewhere I can speak with less assurance, but on the northwest the Santa Catalina Mountains may perhaps mark the dividing line. Of the extent of this faunal area eastward into or through southern New Mexico, and southward into Mexico

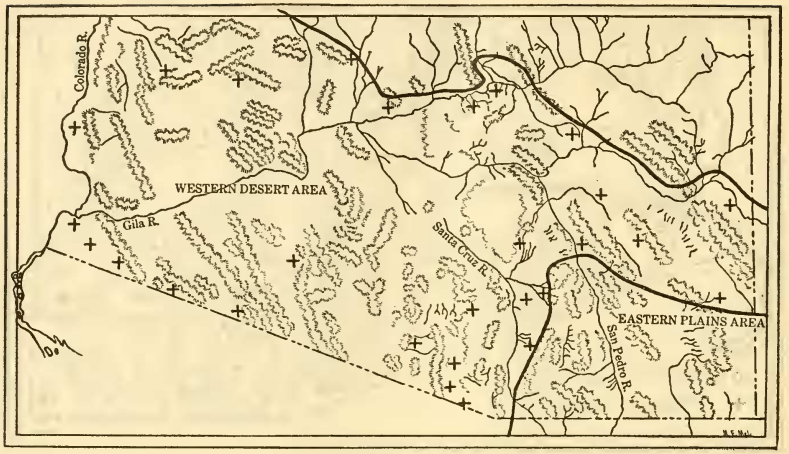

Fig. F. Map showing distribution in southern Arizona of *Ammospermophilus harrisii*. Symbols indicate record stations, mostly from hitherto unpublished data supplied by the United States Bureau of Biological Survey.

I know nothing, but my impression is that the faunal area I am describing in the southeastern corner of Arizona, forms the northwestern portion of a much more extensive area over the regions mentioned.

Aside from Mearns' (1907) divisions along the United States-Mexico boundary line, there has been no previous attempt to indicate in Arizona any faunal divisions other than life zones, but it seems feasible now to outline, though in loose terms and with rather indefinite boundaries, at least five faunal areas into which the state can be divided. The Western Desert Area and the Eastern Plains Area, with which this paper is mainly concerned, are capable of fairly exact definition, and the boundary between these two can be closely indicated. To the northward of these areas is the Central Plateau Area, with the Mogollon Plateau as a center and extending diagonally nearly across the state, from the Grand Cañon at the northwest, to the White Mountains at the southeast. In extreme northeastern Arizona, centering about the Painted Desert and the Little

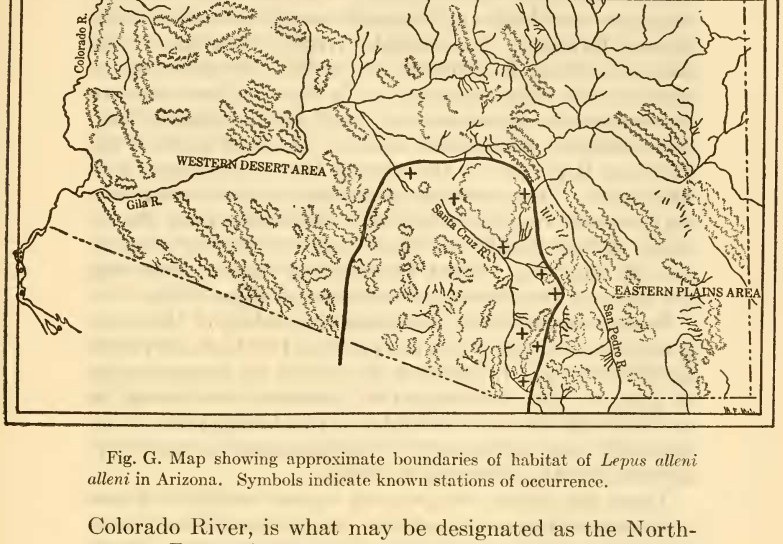

Fig. G. Map showing approximate boundaries of habitat of *Lepus alleni alleni* in Arizona. Symbols indicate known stations of occurrence.

Colorado River, is what may be designated as the Northeastern Desert Area. In the northwest, north of the Colorado River, is a region concerning which I have no first hand knowledge, but which presumably is faunally related to the Great Basin.

The boundary line I have indicated between the Western Desert Area and the Eastern Plains Area does not accord with that described by Mearns (1907, pp. 73-74, pl. II) in his study of the mammals of the Mexican boundary. I can not appreciate any reason for the dividing line he draws across the desert midway between Tucson and Yuma, with the "Western Desert Tract" to the westward, the "Elevated Central Tract" to the eastward. Neither is there any general division of forms in mammals, birds or plants along that line, nor is there any marked change in altitude or climate. The same species and subspecies of mammals and birds, with few exceptions, and the same sorts of vegetation range from the Colorado River eastward to the west base of the Santa Ritas. Grinnell (1914) has shown how potent a barrier the Colorado River is as regards the mam-

mals of the deserts on either side. In the bottom lands the same species of birds and mammals occupy both sides of the stream, forming a characteristic river-bottom fauna; this fauna as a whole is distinctly that of the Arizona valleys to the eastward. My conception of the deserts of southwestern Arizona are as comprising one faunal area, extending from, and including, the bottom lands of the *west* bank of the Colorado River east to the western base of the Santa Rita Mountains. The northern boundary of this desert area may be very roughly indicated as extending from the vicinity of Fort Mohave on the Colorado River, in a southeasterly direction toward Phoenix and Tucson, following the bases of the mountains northeast of those cities.

Faunal conditions at the western boundary of this area, along the Colorado River, are presented by Grinnell (1914) in fullest detail. It has been my aim in the present paper to give as exact a statement as circumstances permit of conditions at the eastern border of this faunal area. Considerably more collecting of small mammals is necessary, however, for the filling out of details.

There are certain conspicuous diurnal mammals whose restriction to one or the other of the two areas here considered is apparent to even rather casual observation. Foremost of these is *Lepus alleni*, as detailed beyond. The restriction of this species east and west within the wider habitat of *Lepus californicus* is one of the most peculiar delimitations among North American animals. In former years the Prairie Dog (*Cynomys ludovicianus arizonensis*) was abundant in southeastern Arizona. Whether or not it has survived persecution by governmental rodent control activities I do not know, but until at least 1907 there were large numbers on the plains between the Huachuca Mountains and Bisbee, and a small and singularly isolated colony some 30 miles farther north, between Fort Huachuca and Fairbank. It is a curious fact that the species did not extend farther north and west over apparently suitable ground. Whether or not it ever reached as far west as the Santa Rita Mountains I do not know; it probably never went beyond.

The Prong-horn (*Antilocapra americana*) was fairly numerous in southeastern Arizona in years past. Upon my first visit to the region, in 1896, there were still herds of

15 or 20 to be found in the San Pedro Valley, and single animals or two or three together were seen by me near the Huachucas and near the east base of the Santa Ritas as late as 1902 and 1903. In 1907 I was told by cattlemen that none remained in that section. The species occurred also in places west of the Santa Ritas, and may still do so here and there, but I do not believe ever in such numbers as on the plains to the eastward.

The small ground squirrels, *Ammospermophilus* and *Citellus*, afford good examples of delimitation of range, and replacement of one species by another in the two regions. Of the smaller nocturnal mammals too little is known to compile any long or exact list of species confined to one section or the other. The pocket gopher (*Thomomys*), prone as this genus is to become differentiated into local forms, apparently is not to be divided in the two regions here considered. Over most of the country no gophers occur, being entirely absent from the hard, dry uplands, distribution taking place along riparian surroundings of the river beds. So division of races of *Thomomys* in this section is apparently entirely altitudinal.

Among birds there are many striking replacements of species or subspecies in the two regions. Some of the most conspicuous are the Gambel Quail and Scaled Quail, and Western Meadowlark and Texas Meadowlark. Some less noticeable replacements are found in subspecies of the Red-winged Blackbird, Cliff Swallow, and Curve-billed Thrasher. It will be noted that although the Western Raven is common in the Lower Sonoran zone of southeastern California and southwestern Arizona, it is rare and mostly an Upper Sonoran species in southeastern Arizona, being replaced on the Lower Sonoran plains of that region by the White-necked Raven.

There is a longer list of bird species from southwestern Arizona than from the southeast, the varied vegetation of the southwest affording congenial surroundings to many that do not occur on the grassy plains. On the other hand, there are certain conspicuous bird species of the southeastern plains that are pretty closely confined to that region, such as the Swainson Hawk, Scorched Horned Lark, and White-necked Raven. There are in the southeast some

Upper Sonoran species characteristic of the region that occasionally descend as far as the upper edge of the plains, and that form one of the several factors tending to give an Upper Sonoran aspect to the lowlands. Some of these are the Western Nighthawk, Western Yellow-wing Sparrow, and the Azure Bluebird. The last mentioned species was not encountered by us, but information recently received by me from Dr. L. B. Bishop, and from Mr. Edward C. Jacot, of Prescott, Arizona, justifies its inclusion in my statement.

The accompanying lists of mammals and birds may serve to convey an idea of the two contrasting faunas. It must be borne in mind, though, that these are not hard and fast divisions and that in many cases species mainly confined to one of the two regions may extend more or less into the other territory. This is especially true of certain birds of the river bottoms, which, occurring in greatest abundance in southwestern Arizona, penetrate in lesser numbers along the more sparsely brush-margined streams of the southeast. This applies to such species as Song Sparrow, Pyrrhuloxia, Least Vireo, and Yellow Warbler. The same is true of certain species of the chaparral of the mesa.

A striking feature of our findings along the dividing line between the two opposed faunal areas is the manner in which many species from either side extend short distances beyond the normal boundary. As a basis for our work the Santa Rita Mountains were a convenient line of demarcation, and forming as they do a colossal wall across the plains, they might easily be supposed to be a barrier in fact as they are in appearance. Again and again, though, we found western species ranging clear around the mountains in a ribbon-like habitat below the eastern foothills, and, conversely, eastern species extending around to the western base of the range. The Allen Jack Rabbit, in small numbers, occurs eastward as far as Sonoita and Patagonia, but at that point finds some insuperable obstacle to its farther extension over the open plains beyond, an obstacle that has no existence for the more widely spread Black-tailed Jack Rabbit. The Scaled Quail ranges westward around the mountainous wall, to be stopped below the western foothills by some impalpable barrier that absolutely forbids farther progress. So, at any point around the base of the moun-

tains one may find in greater or less abundance an infiltration of species that properly belong on the opposite side, with assurance that within a short distance east or west, as the case may be, those species will be found to disappear.

The elucidation of this feature in the distribution of species along this boundary line entails in the case of many of the small nocturnal mammals more extensive trapping than we were able to accomplish. With such an animal as *Dipodomys spectabilis* the conspicuous mounds and burrows are sufficient to advertise its presence, but with many others it is not usually safe to generalize as to their status in either of the faunal areas upon the basis of a limited number of specimens from a few localities. With diurnal mammals and birds the facts are more readily apparent.

Another interesting aspect of distribution in this part of Arizona is found in the manner of occurrence of certain migratory birds. The McCown Longspur, Chestnut-collared Longspur, and Baird Sparrow are all common migrants on the eastern grass-lands, but they do not occur on the western deserts. The Lark Bunting, however, which might be expected to adhere as closely to the open prairie, is far more abundant in western Arizona.

There are certain bird species that have almost or entirely disappeared from Arizona in recent years, exact information regarding which would be of great value and interest in this connection. I refer to the Masked Bob-white (*Colinus ridgwayi*), the Rufous-winged Sparrow (*Aimophila carpàlis*), and the Botteri Sparrow (*Peucœa botterii*). In all likelihood these three birds were mainly inhabitants of grasslands, and there seems little reason to doubt that their disappearance was due entirely to the overstocking of the ranges with cattle. When years of drought came every vestige of their natural cover was destroyed. This explanation has been advanced by Brown (1904) to account for the disappearance of the Bob-white, and it probably explains also the nearly complete extinction locally of the two species of sparrows. The Cassin Sparrow, with similar habitat predilections, is migratory, if, in fact, it breeds in this region at all. So it survives in Arizona and is to be found, we may assume, in the same sort of surroundings that were formerly shared with its vanished relatives.

The delimitation of the ranges of species, east or west, as described in this paper, must be understood to apply to a relatively narrow area bordering the Arizona-Mexico boundary line. Thus, certain of the birds here ascribed to a western habitat are known to occur farther east into New Mexico and Texas, but this eastern extension of range occurs either north or south of the region here under discussion.

BIRDS

WESTERN DESERT AREA	EASTERN PLAINS AREA
	Colinus ridgwayi
Lophortyx g. gambelii	*Callipepla s. pallida*
Melopelia a. trudeaui	
Scardafella inca	
	Buteo swainsoni
Asturina plagiata	
Micropallas w. whitneyi	
Dryobates s. cactophilus	
Colaptes c. mearnsi	
Myiarchus t. magister	
	Otocoris a. adusta
Corvus c. sinuatus	*Corvus cryptoleucus*
Agelaius p. sonoriensis	*Agelaius p. nevadensis*
Sturnella neglecta	*Sturnella m. hoopesi*
	Ammodramus s. bimaculatus
	Peucæa botterii
	Aimophila carpalis
Melospiza m. saltonis	
Cardinalis c. superbus	
Pyrrhuloxia s. sinuata	
Guiraca c. interfusa	
Piranga r. cooperi	
Petrochelidon l. lunifrons	*Petrochelidon l. melanogastra*
Virco b. arizonæ	
Vermivora luciæ	
Dendroica a. sonorana	
Toxostoma c. palmeri	*Toxostoma c. curvirostre*
Toxostoma bendirei	
Polioptila m. melanura	

Mammals

Western Desert Area	Eastern Plains Area
Myotis c. pallidus	*Myotis c. californicus*
Citellus t. neglectus	*Citellus s. canescens*
Ammospermophilus harrisi	
	Cynomys l. arizonensis
Thomomys f. toltecus	*Thomomys f. toltecus*
Perognathus amplus	
Perognathus b. baileyi	
Perognathus p. pricei	*Perognathus p. pricei*
Dipodomys s. spectabilis	
Dipodomys m. merriami	*Dipodomys m. olivaceus*
	Dipodomys o. ordii
Onychomys t. torridus	*Onychomys t. torridus*
Reithrodontomys m. megalotis	*Reithrodontomys m. megalotis*
Peromyscus e. eremicus	*Peromyscus e. eremicus*
Peromyscus m. sonoriensis	*Peromyscus m. sonoriensis*
	Peromyscus l. arizonæ
Sigmodon h. cienegæ	*Sigmodon h. cienegæ*
Neotoma a. albigula	*Neotoma a. albigula*
Lepus a. alleni	
Lepus c. eremicus	*Lepus c. eremicus*
Sylvilagus a. arizonæ	*Sylvilagus a. arizonæ*

CHECK-LIST OF THE BIRDS

1. *Chlidonias nigra surinamensis* (Gmelin)
2. *Nettion carolinense* (Gmelin)
3. *Querquedula cyanoptera* (Vieillot)
4. *Dafila acuta tzitzihoa* (Vieillot)
5. *Ardea herodias treganzai* Court
6. *Butorides virescens anthonyi* (Mearns)
7. *Rallus virginianus* Linnæus
8. *Porzana carolina* (Linnæus)
9. *Fulica americana* Gmelin
10. *Gallinago delicata* (Ord)
11. *Pisobia minutilla* (Vieillot)
12. *Tringa solitaria* Wilson
13. *Actitis macularia* (Linnæus)
14. *Oxyechus vociferus vociferus* (Linnæus)
15. *Callipepla squamata pallida* Brewster
16. *Lophortyx gambelii gambelii* Gambel
17. *Cyrtonyx montezumæ mearnsi* Nelson
18. *Columba fasciata fasciata* Say
19. *Zenaidura macroura marginella* (Woodhouse)
20. *Melopelia asiatica trudeaui* (Audubon)
21. *Chæmepelia passerina pallescens* Baird
22. *Scardafella inca* (Lesson)
23. *Cathartes aura septentrionalis* Wied
24. *Accipiter velox* (Wilson)
25. *Accipiter cooperii* (Bonaparte)
26. *Parabuteo unicinctus harrisi* (Audubon)
27. *Buteo borealis calurus* Cassin
28. *Buteo swainsoni* Bonaparte
29. *Asturina plagiata* Schlegel
30. *Aquila chrysaëtos* (Linnæus)
31. *Cerchneis sparveria phalæna* (Lesson)
32. *Polyborus cheriway* (Jacquin)
33. *Asio wilsonianus* (Lesson)
34. *Otus asio cineraceus* (Ridgway)
35. *Bubo virginianus pallescens* Stone
36. *Speotyto cunicularia hypogæa* (Bonaparte)
37. *Micropallas whitneyi whitneyi* (J. G. Cooper)
38. *Geococcyx californianus* (Lesson)
39. *Coccyzus americanus occidentalis* Ridgway
40. *Ceryle alcyon caurina* Grinnell
41. *Dryobates scalaris cactophilus* Oberholser
42. *Dryobates arizonæ arizonæ* (Hargitt)
43. *Sphyrapicus varius nuchalis* Baird
44. *Melanerpes formicivorus aculeatus* Mearns
45. *Centurus uropygialis uropygialis* Baird
46. *Colaptes cafer collaris* Vigors
47. *Colaptes chrysoides mearnsi* Ridgway
48. *Phalænoptilus nuttallii nuttallii* (Audubon)
49. *Chordeiles virginianus henryi* Cassin
50. *Chordeiles acutipennis texensis* Lawrence
51. *Aëronautes saxatalis* (Woodhouse)
52. *Eugenes fulgens* (Swainson)
53. *Archilochus alexandri* (Bourcier & Mulsant)
54. *Calypte costæ* (Bourcier)
55. *Cynanthus latirostris* Swainson
56. *Tyrannus verticalis* Say
57. *Tyrannus vociferans* Swainson
58. *Myiarchus tyrannulus magister* Ridgway
59. *Myiarchus cinerascens cinerascens* (Lawrence)
60. *Myiarchus tuberculifer olivascens* Ridgway
61. *Sayornis sayus sayus* (Bonaparte)
62. *Sayornis nigricans nigricans* (Swainson)
63. *Nuttallornis mesoleucus* (Lichtenstein)
64. *Myiochanes richardsonii richardsonii* (Swainson)
65. *Empidonax difficilis difficilis* Baird
66. *Empidonax traillii brewsteri* Oberholser
67. *Empidonax hammondii* (Xantus)
68. *Empidonax griseus* Brewster
69. *Pyrocephalus rubinus mexicanus* Sclater
70. *Camptostoma imberbe* Sclater
71. *Otocoris alpestris adusta* Dwight
72. *Otocoris alpestris occidentalis* McCall
73. *Cyanocitta stelleri diademata* (Bonaparte)
74. *Aphelocoma sieberi arizonæ* (Ridgway)
75. *Corvus corax sinuatus* Wagler
76. *Corvus cryptoleucus* Couch
77. *Molothrus ater obscurus* (Gmelin)
78. *Tangavius æneus æneus* (Wagler)
79. *Agelaius phœniceus nevadensis* Grinnell
80. *Sturnella magna hoopesi* Stone
81. *Sturnella neglecta* Audubon
82. *Icterus parisorum* Bonaparte
83. *Icterus cucullatus nelsoni* Ridgway
84. *Icterus bullockii* (Swainson)
85. *Euphagus cyanocephalus cyanocephalus* (Wagler)
86. *Passer domesticus* (Linnæus)
87. *Carpodacus cassinii* Baird
88. *Carpodacus mexicanus frontalis* (Say)
89. *Astragalinus psaltria hesperophilus* Oberholser
90. *Spinus pinus pinus* (Wilson)
91. *Calcarius ornatus* (J. K. Townsend)
92. *Poœcetes gramineus confinis* Baird
93. *Passerculus sandwichensis nevadensis* Grinnell
94. *Ammodramus bairdii* (Audubon)
95. *Ammodramus savannarum bimaculatus* Swainson
96. *Chondestes grammacus strigatus* Swainson
97. *Zonotrichia leucophrys* (Forster)
98. *Zonotrichia gambelii* (Nuttall)
99. *Spizella passerina arizonæ* Coues
100. *Spizella breweri* Cassin
101. *Junco phæonotus palliatus* Ridgway
102. *Amphispiza bilineata deserticola* Ridgway
103. *Peucæa cassinii* (Woodhouse)

104. *Aimophila ruficeps scottii* (Sennett)
105. *Melospiza melodia saltonis* Grinnell
106. *Melospiza melodia fallax* (Baird)
107. *Melospiza lincolnii lincolnii* (Audubon)
108. *Pipilo fuscus mesoleucus* Baird
109. *Oberholseria chlorura* (Audubon)
110. *Cardinalis cardinalis superbus* Ridgway
111. *Pyrrhuloxia sinuata sinuata* (Bonaparte)
112. *Hedymeles melanocephalus melanocephalus* (Swainson)
113. *Guiraca cærulea interfusa* Dwight & Griscom
114. *Passerina amœna* (Say)
115. *Spiza americana* (Gmelin)
116. *Calamospiza melanocorys* Stejneger
117. *Piranga ludoviciana* (Wilson)
118. *Piranga hepatica oreophasma* Oberholser
119. *Piranga rubra cooperi* Ridgway
120. *Petrochelidon lunifrons melanogastra* (Swainson)
121. *Hirundo erythrogastra* Boddaert
122. *Tachycineta thalassina lepida* Mearns
123. *Stelgidopteryx serripennis* (Audubon)
124. *Bombycilla cedrorum* Vieillot
125. *Phainopepla nitens* (Swainson)
126. *Lanius ludovicianus excubitorides* Swainson
127. *Vireosylva gilva swainsonii* (Baird)
128. *Lanivireo solitarius cassinii* (Xantus)
129. *Lanivireo solitarius plumbeus* (Coues)
130. *Vireo huttoni stephensi* Brewster
131. *Vireo belli arizonæ* Ridgway
132. *Vermivora luciæ* (J. G. Cooper)
133. *Vermivora ruficapilla gutturalis* (Ridgway)
134. *Vermivora celata lutescens* (Ridgway)
135. *Dendroica æstiva sonorana* Brewster
136. *Dendroica æstiva brewsteri* Grinnell
137. *Dendroica auduboni auduboni* (J. K. Townsend)
138. *Dendroica nigrescens* (J. K. Townsend)
139. *Dendroica townsendi* (J. K. Townsend)
140. *Oporornis tolmiei* (J. K. Townsend)
141. *Geothlypis trichas scirpicola* Grinnell
142. *Geothlypis trichas occidentalis* Brewster
143. *Icteria virens longicauda* Lawrence
144. *Wilsonia pusilla pileolata* (Pallas)
145. *Wilsonia pusilla chryseola* Ridgway
146. *Setophaga picta* Swainson
147. *Mimus polyglottos leucopterus* (Vigors)
148. *Toxostoma curvirostre curvirostre* (Swainson)
149. *Toxostoma curvirostre palmeri* (Coues)
150. *Toxostoma bendirei* (Coues)
151. *Toxostoma crissale crissale* Henry
152. *Heleodytes brunneicapillus couesi* (Sharpe)
153. *Salpinctes obsoletus obsoletus* (Say)
154. *Catherpes mexicanus conspersus* Ridgway
155. *Thryomanes bewickii eremophilus* Oberholser
156. *Troglodytes aëdon parkmanii* Audubon
157. *Sitta carolinensis nelsoni* Mearns
158. *Bæolophus wollweberi annexus* (Cassin)
159. *Psaltriparus plumbeus* (Baird)
160. *Auriparus flaviceps flaviceps* (Sundevall)
161. *Regulus calendula calendula* (Linnæus)
162. *Polioptila cærulea amœnissima* Grinnell
163. *Polioptila melanura melanura* Lawrence
164. *Hylocichla ustulata ustulata* (Nuttall)

General Accounts of the Birds

1. **Chlidonias nigra surinamensis** (Gmelin)

Two specimens (Nos. 29822-29823), birds of the year, were collected six miles north of Patagonia, September 8. There are few records of the occurrence of this species in Arizona, but it was collected by Henshaw in August in Cochise County (Henshaw, 1875, p. 487; Saunders, 1896, p. 22) and is probably a fairly regular late summer migrant in the southeastern section of the state.

2. **Nettion carolinense** (Gmelin)

Small flocks were seen on cattle "tanks" near Patagonia, on September 22, when an immature male (No. 29824) was collected, and on the 23rd, when a female (No. 29826) was shot.

3. **Querquedula cyanoptera** (Vieillot)

A few birds, paired or singly, appeared on the several reservoirs and "tanks" on the Ashburn ranch, May 11 to 20. We were told that prior to our arrival ducks of several species had been of fairly common occurrence there. Presumably the few we saw were the last straggling migrants. A female Cinnamon Teal (No. 29825) was collected September 23, and others were seen.

4. **Dafila acuta tzitzihoa** (Vieillot)

A flock of ten or twelve seen near Patagonia, September 1, and one specimen (No. 29827) preserved. Ducks that may have been of the same species were seen later, in September and October.

5. **Ardea herodias treganzai** Court

A single bird, possibly the same individual, was seen near Patagonia several times during the first two weeks of September.

6. **Butorides virescens anthonyi** (Mearns)

An adult female (No. 29407) was taken on one of the small lakes on the Ashburn ranch, May 24, and a young female (No. 29828) at the same place, September 15. The species is known to breed in southern Arizona.

7. **Rallus virginianus** Linnæus

Seen several times (May 11 to 20) on the lakes on the Ashburn ranch. There are very few records of the occurrence of this species in Arizona (see Swarth, 1914, p. 17), and, while it has been found nesting in the White Mountains (Goldman, 1926, p. 163), there are no breeding records from any more southern locality. The birds that we saw may have been migrants.

8. **Porzana carolina** (Linnæus)

One seen near Patagonia on September 13.

9. **Fulica americana** Gmelin

A pair of coots were settled during May on one of the lakes on the Ashburn ranch, presumably nesting or preparing to do so.

10. **Gallinago delicata** (Ord)

One seen near Patagonia on September 9.

11. **Pisobia minutilla** (Vieillot)

One specimen (No. 29833) was collected at a cattle "tank" near Patagonia on September 19.

12. **Tringa solitaria** Wilson

Four specimens collected, taken August 29, August 31, September 10, and September 11, respectively, all within a few miles of Patagonia (Nos. 29829-29832). It is not possible to designate these with certainty as of either of the two subspecies into which this species has been divided, *Tringa solitaria solitaria* and *T. s. cinnamomea*. Two are males, two females. The two females possess the marking on the inner web of the outer primary that is supposed to distinguish *cinnamomea*, the two males do not. None of the four is markedly cinnamomeous in dorsal spotting, all being essentially like eastern birds in this regard. Wing measurements (in millimeters) are as follows: males, 127, 136; females, 134, 138. Comparison with Ridgway's (1919, pp. 358, 363) measurements of the two subspecies will show how inconclusive these figures are. I have elsewhere (Swarth, 1926, p. 70) given my reasons for doubting the existence of two distinguishable subspecies of *Tringa solitaria*.

13. **Actitis macularia** (Linnæus)

Several seen on the Ashburn ranch, usually at the muddy margin of the watering places of the cattle, at intervals until May 22. Two collected near Patagonia in the fall, on August 31 and September 20, respectively (Nos. 29834-29835).

14. **Oxyechus vociferus vociferus** (Linnæus)

Relatively abundant in the Sonoita Valley. This is an arid region, of course, with little to attract even as adaptable a wader as the Killdeer, but wherever there was surface water some were to be found. Newly hatched young appeared during the second week in May. One specimen was collected near Patagonia on August 30 (No. 29836).

15. **Callipepla squamata pallida** Brewster

This, the common quail of the southeastern portion of Arizona, was surprisingly rare in the valley of the Sonoita. In previous years I had found it in fair abundance in the nearby valley of the San Pedro River, but along the Sonoita, so I was told, quail never had been common. However that may be, we saw but one pair of Scaled Quail during our stay in this region, this at a point some five miles north of Patagonia, on May 20. On our several trips between Patagonia and Tucson, we invariably began to see a few as soon as we rounded the north end of the Santa Rita Mountains. On the mesa along the west base of the Santa Ritas they were abundant, slightly outnumbering the Gambel Quail in that section. The harsh, clanging, two-syllabled call-note of the Scaled Quail was a familiar sound, heard mostly in the early morning. During the first three weeks in June the birds were almost invariably in pairs, sometimes two, three, or even four pairs, being seen in company. A female shot June 4 had not yet begun to lay, but contained an egg about half-formed. On June 14 a young bird was seen, scuttling along with its parents, so tiny that it seemed likely that the rest of the brood was not yet hatched.

The territory immediately below the west base of the Santa Rita Mountains is the westernmost limit of the Scaled Quail's range. A pair seen several miles north of Continental (some ten miles west of the mountains) represents our farthest point of observation in that direction. I know of no records west of the Santa Cruz River. Farther north the species is known to range west to Oracle (some 60 miles exactly north of our Santa Rita station), which point it

apparently reaches by way of the valley of the San Pedro. The section about Tucson, midway between the Santa Rita Mountains and Oracle, is inhabited (exclusively, I believe) by the Gambel Quail. It is noteworthy that the Scaled Quail skirts the apparent barrier of the Santa Rita Mountains to the western base of the range, where it is halted by some condition that is less obvious to the view, though more effective, than the mountain wall. The only apparent change in the valley beyond lies in its gentle descent to a lower altitude (from about 4000 feet at the Florida Ranger Station to 2400 feet at Tucson). Vegetation and other factors remain essentially the same.

Four specimens of Scaled Quail were collected, three males and one female (Nos. 29408-29411).

16. **Lophortyx gambelii gambellii** Gambel

A pair that were seen on May 28 a few miles east of Patagonia were the only ones noted in that region in the early summer. In the fall several flocks were encountered there. In the western foothills of the Santa Ritas and on the mesa below, this was a common species. Newly hatched young were encountered on June 5, and others, somewhat larger, were often seen thereafter. Young that were unable to fly were frequently found several miles from the nearest water, in contradiction to the theory advanced by Grinnell (1927b, p. 528) regarding *Lophortyx californica*, that the young would perish unless hatched within a short distance of where water could be obtained. (In this connection see Vorhies, 1928.)

This is a more western bird than the Scaled Quail, and finds in the Santa Rita region its eastern limit in southern Arizona, though its general range extends to western Texas. Our work was in a section that forms marginal territory, where the ranges of Scaled and Gambel quails overlap. The Gambel Quail, however, does not extend to the east side of the Santa Ritas in anything like the numbers of the Scaled Quail on the west side. There are a few scattered records of occurrence a little farther to the eastward, near Fort Huachuca and near Tombstone, but the species is rare anywhere east of the Santa Rita Mountains.

Thirteen specimens were collected (Nos. 29413, 29414, 29837-29845, 30247, 30248): two adult males on the Santa Rita Range Reserve in June; two females in Madera Cañon, September 26; three males and six females at points near Patagonia, September 11 and October 6. The fall birds had all completed, or nearly completed, the molt. On one young female shot October 6 a few feathers of the juvenal plumage still persist.

17. **Cyrtonyx montezumæ mearnsi** Nelson

On June 18 two (not a pair) were seen and an adult male (No. 29412) collected in Stone Cabin Cañon at an elevation of about 7000 feet. During the fall collecting, a young male (No. 30246) almost entirely in juvenal plumage, was collected in Madera Cañon on September 17, one of a small flock. A single bird, believed to be of this species, was flushed from a corn field in the San Rafael Valley, September 30, and a flock of about 20 in grass land near the railroad station of Sonoita on October 11.

18. **Columba fasciata fasciata** Say

During the last week in May a few Band-tailed Pigeons were seen in Monkey Spring Cañon, on the Ashburn ranch. About our camp at the Florida Ranger Station they were present in numbers. Acorns were ripening at that time in the clump of oaks that sheltered our camp and the pigeons were constantly in the trees, paying very little attention to our presence. They seemed to come from a distance to feed here, apparently from high up in the mountains, where, presumably, they were nesting. Two specimens were collected, both adult males (Nos. 29415-29416). On September 1 and 2, flocks were seen near Patagonia. In Madera Cañon small flocks were seen during the first week in October, the last on October 7.

19. **Zenaidura macroura marginella** (Woodhouse)

A common species throughout southern Arizona, and found in fair numbers in the territory where we were working. Nests with eggs were found near Patagonia the middle

of June, several of them in small mesquite trees, six or eight feet from the ground.

Mourning Doves were abundant about Patagonia at the end of August and early in September, and in lesser numbers at that season on the west side of the Santa Rita Mountains. Three specimens were collected in Madera Cañon, a young male September 12, and adult male and female October 5 (Nos. 30249-30251).

20. **Melopelia asiatica trudeaui** (Audubon)

In the Sonoita Valley, near Patagonia, there were some White-winged Doves when we arrived (May 10), and they increased in numbers daily. We were told that they first had been seen but a few days before we came. At the west base of the Santa Ritas they were numerous, and by the time we had moved to that side they were nesting. A nest with two eggs, incubation advanced, was found June 7. It was in a hackberry overhanging the edge of a wash, the nest placed on a flat crotch some ten or twelve feet above the floor of the gully.

The White-winged Dove is not at all common nor of general distribution farther east in Arizona; west to the Colorado River it is everywhere in the lowlands. In previous collecting in Cochise County (immediately east of the Patagonia region) I had found it nesting along the San Pedro River, though not nearly so abundantly as along the Sonoita; in the Huachuca Mountains (some 25 miles east of the Sonoita) I never found it nesting at all.

At the end of August there were a few of these doves about Patagonia, and they were seen occasionally nearly throughout September. The last was noted on September 23. Eleven specimens were collected (Nos. 29417-29425, 29846, 29847), all from the vicinity of Patagonia, nine adults in May, a molting adult September 22, and a young bird August 30.

21. **Chæmepelia passerina pallescens** Baird

First seen on the Ashburn Ranch May 17, and at intervals during the next two weeks. At the west base of the Santa Ritas the species was present in small numbers.

Four specimens were collected, adult male and female, on the Ashburn Ranch, May 29 (Nos. 29426-29427), another pair (Nos. 29848-29849) two miles south of Patagonia on September 13.

22. **Scardafella inca** (Lesson)

One seen in a garden in Patagonia on May 28, and others noted in the vicinity of the town in August and September, the last on September 23. Two collected, on August 30 and September 11, respectively (Nos. 29850-29851). The later taken individual was still in the midst of the annual molt.

23. **Cathartes aura septentrionalis** Wied

Abundant throughout the region. It was striking to see the way in which the Turkey Buzzard has adapted itself to a new source of food. Many small mammals are killed by autos on the highways over the desert, among which jack rabbits are the most conspicuous. The Buzzards haunt the roads and descend upon the crushed rabbits a very short time after they are killed. It was noteworthy with what agility these ungainly birds would avoid an approaching machine, waiting until it had come within few yards before swinging out to one side, out of the way, then back to the carcass without delay. As many as eight or nine Turkey Buzzards were seen around one dead rabbit, and the carcasses were, of course, usually disposed of within a few hours.

24. **Accipiter velox** (Wilson)

An immature male was collected near Patagonia on September 28 (No. 29854). It is a common migrant in the region.

25. **Accipiter cooperii** (Bonaparte)

Frequently observed, on both sides of the Santa Ritas. A pair remained about our camp at the Florida Ranger Station so persistently that it seemed likely that they had a

nest nearby. Two specimens were collected (Nos. 29428-29429), a male near Patagonia, June 1, in immature plumage, very worn and faded, and an adult female, near the Florida Ranger Station, June 6.

26. **Parabuteo unicinctus harrisi** (Audubon)

Several seen in a flight of Swainson Hawks near Sonoita, on September 16.

27. **Buteo borealis calurus** Cassin

Of fairly common occurrence throughout the lowlands of Arizona, and seen by us at frequent intervals throughout our stay. Two specimens were collected (Nos. 29430-29431), both in immature plumage and apparently non-breeding birds, taken on May 17 and June 14, respectively.

28. **Buteo swainsoni** Bonaparte

A summer visitant to Arizona, where it is most numerous on the open plains. We first met with the species on May 23, when a single bird was taken in San Rafael Valley; May 25 a number were observed at the same place. On the west side of the Santa Ritas the species was not abundant, but several pairs were scattered over the mesa. A nest found on the Santa Rita Range Reserve contained on June 11 a single egg, on June 16 a newly hatched young bird. It was in a palo verde, the tallest tree in the vicinity, about 20 feet from the ground. The nest was a bulky structure, about four feet across, built entirely of rather large sticks and twigs. With the young bird we found the remains of a very small cottontail rabbit and a kangaroo rat. Both parent birds remained in the vicinity when the nest was visited, circling about and screaming, but not venturing near.

A large flight of migrating Swainson Hawks was seen on the plains near Sonoita on September 16, two birds at about the same place on September 23. Three specimens were collected (Nos. 29432, 29433, 29855): a male in immature plumage, badly worn, on May 23, an adult female, not yet

laying, on June 2, and an immature female, September 16. The first contained in its stomach the remains of a lizard, the second, mammal fur.

29. **Asturina plagiata** Schlegel

Seen in the vicinity of Patagonia several times during September. Two specimens collected on September 24, an adult male and an immature male (Nos. 29852-29853). The adult is just finishing the molt from the immature plumage.

30. **Aquila chrysaëtos** (Linnæus)

Seen occasionally, most often on the west side of the Santa Ritas. One was observed eating a dead rabbit by the roadside, an animal that had not been killed by the eagle itself.

31. **Cerchneis sparveria phalæna** (Lesson)

A fairly common species in this region during the summer. About Patagonia pairs were spaced along the Sonoita and in the bottoms of the cañons descending from the Santa Ritas and the Patagonia Mountains, where rows of sycamores and other large trees afforded nest sites and look-out posts. West of the Santa Ritas Sparrow Hawks occur mostly where giant cactus supplies the needed nest cavities.

A nest with four eggs was found in Temporal Cañon at about 4500 feet elevation, May 28, in a natural cavity in a sycamore, about 11 feet from the ground. This cañon is broad and open, with barren slopes on either side, affording the open country that the Sparrow Hawk seems to require.

Two adult males were collected near Patagonia, on May 18 and 20, respectively, and a female below the mouth of Madera Cañon, October 5 (Nos. 29434-29435, 30252).

32. **Polyborus cheriway** (Jacquin)

Seen on several occasions in the Santa Cruz Valley between Tucson and the Santa Rita Mountains. One was observed standing by a pool of water at the roadside some 20

miles south of Tucson, on June 2. On June 10, on the Santa Rita Range Reserve, I shot at one that was feeding with some Turkey Buzzards on a dead jack rabbit, but it flew away, though mortally wounded. Two days later I found the dead bird and saved the complete skeleton. This individual was in excessively worn and faded plumage, and beginning the annual molt. Other Caracaras were seen in the same general region.

33. **Asio wilsonianus** (Lesson)

A young bird (No. 29436), recently out of the nest, was collected at about 5000 feet altitude in Stone Cabin Cañon, Santa Rita Mountains. It was accompanied by one of the parent birds. This young bird was, of course, hatched in the immediate vicinity of the place where it was found, and it constitutes, I believe, the first breeding record for the species in Arizona. I do not know that it has ever been reported as nesting anywhere so far south.

34. **Otus asio cineraceus** (Ridgway)

At our camp near the mouth of Stone Cabin Cañon, Screech Owls were heard calling occasionally at dusk. In the late evening of June 13 an entire family was discovered in trees near the camp, and an adult male and a male and female in juvenal plumage were collected (Nos. 29439-29441).

35. **Bubo virginianus pallescens** Stone

Seen on several occasions in the vicinity of Patagonia, and less often on the Santa Rita Range Reserve. So far from being helpless in day time, the several Horned Owls that were observed at the latter place were as wary as any hawk, taking flight in the blazing sunshine when the observer was still out of gun-shot range, and flying to such a distance as successfully to avoid pursuit.

Two adult females (Nos. 29437-29438) were collected near Patagonia in May, on the 14th and 27th, respectively. The stomach of the first contained remains of a wood rat

(*Neotoma*) and a large snake. These two birds are darker colored than the average example of *pallescens*, being closely similar to certain specimens of *pacificus* from the San Joaquin Valley, California. In one the feet are immaculate and nearly white, in the other they are heavily spotted on a tawny ground. A third specimen (No. 29856), collected near Patagonia on September 30, is paler colored than the others, and much nearer the mode of *pallescens*.

36. Speotyto cunicularia hypogæa (Bonaparte)

Seen but once, a single bird in the San Rafael Valley, May 23. It is hard to understand the absence of this species from the region. In previous visits to southern Arizona I had found Burrowing Owls in prairie dog towns, but rarely elsewhere, and had assumed that their absence was due to the lack of burrowing animals that could supply them with homes, though it would seem that the large kangaroo rat of the region and the several species of small ground squirrels might meet the need. To emphasize the problem, I had brought to my notice conditions in Imperial Valley, California, through which we passed on our way home. Here, in the cultivated sections, redeemed from the desert in recent years, Burrowing Owls are as abundant as I have seen them anywhere, as they certainly were not under original desert conditions. In Imperial Valley there are no mammals better suited to dig holes for the owls than the species found in Arizona, where the birds are so nearly absent, so it would seem that there must be other reasons explaining their presence or absence in any section.

37. Micropallas whitneyi whitneyi (J. G. Cooper)

There are no giant cactuses in the Patagonia region, and but very few near our camp-site on the west side of the Santa Ritas, and the Elf Owl is so closely associated with this plant during the breeding season that it is useless searching for it elsewhere. A scanty assemblage of cactuses, not over ten or twelve plants all told, is scattered over the mesa east of Continental, and these were examined on June 15. One family of Elf Owls was collected, an adult

female with two newly hatched young (Nos. 29442-29444), and a second adult was seen in another cactus, too high up in the plant for the ladder to reach. The species is almost unknown east of the Santa Ritas.

38. Geococcyx californianus (Lesson)

Seen a number of times in the vicinity of Patagonia, but not nearly so numerous as in the chaparral about Tucson. Abundant on the Santa Rita Range Reserve, as elsewhere in this valley, and usually in pairs at the time of our visit in June. An adult male was collected near Patagonia on May 25, an immature male in Madera Cañon, September 10, and an adult female below Madera Cañon, October 8 (Nos. 29445, 30253, 30254).

39. Coccyzus americanus occidentalis Ridgway

First observed near Patagonia, May 25. Others were seen and heard several times during the next few days, and it seemed evident that they were just arriving from the south. Several were seen near the Florida Ranger Station during June, and two were collected there, an adult male and female, taken June 14 and 16, respectively (Nos. 29446-29447). The female contained in its stomach two green caterpillars and a lizard 100 millimeters long, the latter swallowed entire and rolled into a coil. This seems a startling diet for a tree-dwelling cuckoo, but there is at least one other instance reported, also from the vicinity of Tucson, of a lizard being taken by one of these birds (Visher, 1910, p. 282). During the last week in August cuckoos were seen in fair abundance about Patagonia, and in lesser numbers somewhat later, the last on September 11. Four specimens were taken at that time (Nos. 29857-29860).

The validity of the subspecies *occidentalis* has been questioned by W. E. Clyde Todd (1922, p. 213), and, it seems to me, on good grounds. Between the eastern and western races of the Yellow-billed Cuckoo there is a slight average difference in size, the western bird being the larger and with a somewhat heavier bill. There is a rather wide range of variation in specimens from any one locality, as shown in

the accompanying table, and the largest eastern birds do not fall far short of the maximum measurements of western specimens (see Ridgway, 1916, pp. 12-19). Birds from the Pacific coast are the largest, those from central Arizona near the type locality of *occidentalis* (the Santa Rita Mountains) are intermediate in size. The subspecies would have a better claim to recognition if restricted to the Pacific coast, but I am unwilling to suggest the changes in nomenclature that such a course would necessitate. I retain the name *occidentalis* here in deference to the opinions of others, but the subspecies is certainly as slightly differentiated as any in our *Check-list*, and I feel that no violence to the facts would result from suppression of the name.

40. **Ceryle alcyon caurina** Grinnell

Seen occasionally during September, along the Sonoita below Patagonia and about the small lakes on the Ashburn ranch, where two specimens were collected on September 20 (Nos. 29861-29862). One was taken in Madera Cañon, far from any fish-inhabited water, on September 14 (No. 30255).

41. **Dryobates scalaris cactophilus** Oberholser

In southeastern Arizona, east of the Santa Rita Mountains, the vast areas of prairie land are for the most part unsuitable to this species. Wherever even a scanty growth of chaparral has found a foothold, though, the Cactus Woodpecker is pretty sure to occur, for it does not require large trees. Along the streams and washes in this same area, as elsewhere, it does frequent the sycamores and other larger growths, but these do not form the preferred habitat. In the lowlands west of the Santa Rita Mountains this woodpecker is in the surroundings that suit it best. It does not frequent the giant cactus (I do not believe that there is a known instance of its nesting in one), but stays nearer the ground, in cholla cactus, creosote bush, catclaw or other low-growing vegetation.

Seventeen specimens were taken: from Patagonia, five in May and four in September; from the Santa Rita Range

Measurements in millimeters of *Coccyzus americanus occidentalis*

Collection	No.	Sex Age	Locality	Date	Wing	Tail	Culmen	Tarsus
H. S. Swarth	3115	♂ ad.	Huachuca Mts., Arizona	Aug. 2, 1902	146.0	146.5	24.5	27.0
H. S. Swarth	4028	♂ ad.	Tucson, Arizona	June 5, 1903	150.0	149.0	26.0	26.5
G. F. Morcom		♂ ad.	Tucson, Arizona	June 6, 1903	143.0	148.0	27.0	27.0
C. A. S.	29446	♂ ad.	Santa Rita Mts., Arizona	June 14, 1927	143.5	144.5	26.0	25.0
C. A. S.	29857	♂ ad.	Patagonia, Arizona	Sept. 5, 1927	141.0	148.0	25.0	25.0
H. S. Swarth	2011	♀ ad.	Huachuca Mts., Arizona	June 21, 1896	156.0	154.0	28.0	27.0
H. S. Swarth	4044	♀ ad.	Tucson, Arizona	June 10, 1903	150.0	159.0	28.5	27.5
G. F. Morcom		♀ ad.	Huachuca Mts., Arizona	July 1, 1896	151.0	148.0	26.5	27.0
G. F. Morcom		♀ ad.	San Pedro R., Arizona	June 10, 1902	149.0	145.0	27.0	27.5
G. F. Morcom		♀ ad.	Tucson, Arizona	June 3, 1903	152.0	153.0	27.0	27.0
C. A. S.	29447	♀ ad.	Santa Rita Mts., Arizona	June 16, 1927	152.5	157.0	26.0	27.0
C. A. S.	29860	♀ ad.	Patagonia, Arizona	Sept. 9, 1927	154.0	155.0	26.0	26.5

Reserve, three adults and two juveniles (June 6 and 7); from lower Madera Cañon, three collected in September and October (Nos. 29448-29457, 29863-29866, 30256-30258).

42. Dryobates arizonæ arizonæ (Hargitt)

An Upper Sonoran zone species that barely descends into the region where we did most of our work in the spring. In the Patagonia section, a few individuals follow the scattered oaks down to the edge of the valley, where an adult male was collected May 19. A few were seen, also in oak trees, near the western base of the Santa Ritas, where an adult male was taken on June 7, and a full-grown juvenal on June 18.

Specimens were collected at Fort Crittenden, September 19, at a point five miles west of Patagonia, October 7, and three in lower Madera Cañon, September 6 and 23, and October 3. Eight specimens in all were taken (Nos. 29458-29460, 29867, 29868, 30259-30261). Male birds shot September 6 and 19 still retain traces of the juvenal head marking.

43. Sphyrapicus varius nuchalis Baird

A winter visitant to the region. Specimens were taken at Patagonia, October 6, and at Sonoita, October 11 (Nos. 29869-29870).

44. Melanerpes formicivorus aculeatus Mearns

Breeding in small numbers in the Patagonia region, mostly in the sycamores and other trees along the Sonoita. We collected five specimens there on dates ranging from May 14 to June 1, all adults. More abundant in the fall, when eight were collected near Patagonia and Fort Crittenden on dates ranging from September 9 to October 12. Five were taken in Madera Cañon between September 3 and 24. Eighteen specimens in all were preserved (Nos. 29461-29465, 29871-29878, 30262-30266).

45. Centurus uropygialis uropygialis Baird

Very few seen in the spring, either about Patagonia or on the west side of the mountains, neither place seeming to afford needed conditions. They are most abundant in groves of giant cactus and in mesquite-grown river bottoms. We collected one specimen, an adult male, near Patagonia on May 15 (No. 29466). More abundant about Patagonia in the fall, when eight specimens were taken, between August 29 and October 8 (Nos. 29879-29886). Birds collected during the first week in September were still in the molt.

46. Colaptes cafer collaris Vigors

There were a few Red-shafted Flickers in the valley near Patagonia, and more in the wooded foothills of the nearby Santa Rita Mountains. A full grown juvenile (No. 29468) was collected three miles southwest of Patagonia, June 1. On the west side of the Santa Ritas an adult male (No. 29469) was taken near the head of Stone Cabin Cañon (7000 feet altitude) on June 18. The latter is the most heavily marked bird, as regards size of black spots on the under parts, and the black crescent on the breast, that I have seen from any region. Common in Madera Cañon (5200 feet altitude) in the fall.

47. Colaptes chrysoides mearnsi Ridgway

The Gilded Flicker is so closely confined to the giant cactus, at least during the nesting season, that it is little more than a chance to find one elsewhere. At Patagonia, which is beyond the eastern limit of the giant cactus in this section, perhaps six or seven of the Flickers were seen during the month we spent there. During several previous years, when I collected assiduously and for long periods of time in the region immediately to the eastward, in Cochise County, Arizona, not a single Gilded Flicker was observed there. The eastern foothills of the Santa Rita Mountains may thus be taken as the eastern limit of the range of the Gilded Flicker in southern Arizona. We saw the species occasionally on the Santa Rita Range Reserve, west of the

mountains, but not often, for there were but few giant cactuses in the region where we worked.

Two specimens, adult male and female, were collected on the Ashburn Ranch, north of Patagonia. The female (No. 29470, May 30) is a normal example of the species. The male (No. 29467, May 17) has the usual yellow color of the wings and tail of *chrysoides* replaced by red, as in *cafer*. In fact, the only feature by which the specimen can be recognized as an example of *chrysoides* is its small size. The bird is similar to specimens described and discussed by Grinnell (1914, p. 136), and its appearance doubtless is to be explained in the same way, namely, as the result of a "proneness to replacement of yellow by red, without there having been any interbreeding with another species" (Grinnell, *loc. cit.*). It should be pointed out, though, that, in the specimen in hand, the red is decidedly deeper than in Grinnell's Colorado River specimens, being of exactly the shade seen in *cafer*; and that the dark markings generally (such as the dusky bars on the upper surface) are decidedly darker and more extensive than is usual in *chrysoides*, being again just as in *cafer*. Were it a hybrid between *cafer* and *chrysoides*, though, it seems likely that the size of the bird would have been greater than it is. Its measurements are those of the smaller *Colaptes chrysoides mearnsi*.

48. **Phalænoptilus nuttallii nuttallii** (Audubon)

Poor-wills were heard every evening at our camp on the Ashburn Ranch, near Patagonia. One specimen, an adult male (No. 29491), that was collected there on May 27, responded to a whistled imitation of its call note by approaching instantly and alighting on a fence post within a few yards of the imitator. They were seen and heard with fair frequency about our camp near the Florida Ranger Station during June.

49. **Chordeiles virginianus henryi** Cassin

A Nighthawk was flushed by Gilmore from the limb of an oak tree, near old Fort Crittenden, May 30. No Texas Nighthawks were seen by us in this region, nor (in my

experience) does *texensis* ordinarily roost in trees. The Western Nighthawk does so habitually, and I have no doubt that the bird seen was of this species.

50. **Chordeiles acutipennis texensis** Lawrence

Extremely abundant in the lowlands west of the Santa Rita Mountains but not seen by us east of that point. Frequently abroad during the day in the hottest sunshine. A set of two eggs (much incubated) was taken on June 4. The sitting bird was exposed to the full glare of the sun, the eggs being placed on a gravelly ridge, at the base of a little mesquite, some six feet high, which gave no sheltering shade. Three skins of this species were preserved, an adult female (parent of the above described set of eggs), an adult female taken on June 11, and a downy nestling taken June 13 (Nos. 29492-29494).

51. **Aëronautes saxatalis** (Woodhouse)

Seen in both the eastern and western foothills of the Santa Ritas, and on many occasions. One specimen was collected, an adult male, June 2 (No. 29471). For the use of the name *saxatalis* see the discussion of this case by Oberholser (1920, p. 294), with whose conclusions I am in accord. No one who has seen the White-throated Swift in life can doubt the application of Woodhouse's description.

52. **Eugenes fulgens** (Swainson)

A Transition zone species within whose confines we barely entered. An adult male (No. 29472) was collected in Stone Cabin Cañon at about 7000 feet altitude, June 18, and one or two female hummingbirds that may have been of this species were seen near our camp at the mouth of the cañon.

53. **Archilochus alexandri** (Bourcier & Mulsant)

This was the only species of hummingbird definitely identified by us in the vicinity of Patagonia. Adult males were seen not uncommonly, and a great many more females,

usually along streams or washes, about sycamores and willows. An adult female was collected on the Ashburn Ranch, May 12 (No. 29473), and a young bird, full grown, in Madera Cañon, September 13 (No. 30268).

54. **Calypte costæ** (Bourcier)

Definitely identified only in the vicinity of our camp near the Florida Ranger Station. A young bird and the accompanying female parent were collected on June 16 (Nos. 29474-29475). No adult males were seen.

55. **Cynanthus latirostris** Swainson

An adult female was collected in Madera Cañon, September 13 (No. 30267). This, I believe, is the latest fall date upon which the species has been taken in Arizona.

56. **Tyrannus verticalis** Say

A common species in the lowlands of Arizona. Seen in some numbers on both sides of the Santa Rita Mountains, from the lowest foothills out into the valleys. Kingbirds of both species were numerous about Patagonia early in September and remained in diminishing numbers until October 11. The difficulty of distinguishing between *verticalis* and *vociferans* in life, especially in their molting condition at that time, prevented the securing of definite dates of departure of each species. An adult *verticalis* (No. 29889) was taken on September 7, then in the midst of the annual molt.

57. **Tyrannus vociferans** Swainson

Very abundant in the Sonoita Valley, and in scarcely lesser numbers in the western foothills of the Santa Ritas. An extremely noisy species at the beginning of the nesting period, but restricting its worst clamor to the early morning hours. At our camp on the Ashburn Ranch I was awakened every morning by an outrageous chorus of these birds, beginning shortly before the first gray appearance of dawn

and continuing until nearly sunrise, when the noise ceased rather abruptly. Occasionally some restless individual would awaken an hour or two before dawn and begin his shrill outpourings, but meeting with no response, would subside for the time being. By the second week in June the kingbirds had quieted down and called but little.

Adults collected near Patagonia during the first two weeks in September are molting, with the old remiges and rectrices partly replaced by half-grown new feathers. Two young birds (September 5 and 6) are mostly in juvenal plumage. In one the juvenal rectrices are being replaced by new feathers. In the young bird the tail feathers are shorter than in the later plumages, and are narrowly tipped with rusty brown. In the succeeding feathers the ends are broadly margined with yellowish gray. The specimens at hand do not show conclusively that the juvenal remiges also are renewed at this time but it seems likely that they are. The latest taken fall specimens were collected on October 2 at Patagonia, on October 6 in Madera Cañon.

Fifteen specimens in all were collected (Nos. 29476-29482, 29887, 29888, 29890-29892, 30269-30271), ten adults and two juveniles near Patagonia, three adults in Madera Cañon.

58. **Myiarchus tyrannulus magister** Ridgway

Seen in small numbers in the eastern foothills of the Santa Rita Mountains. The first arrival appeared on the evening of May 15, and others were observed during the next few days. A mated pair was collected in Temporal Cañon at 4800 feet altitude. From the region east of the Sonoita Valley there are no records of the occurrence of this bird, though a great deal of careful ornithological work has been done there. In the Santa Cruz Valley, west of the Santa Ritas, the species is known to be fairly common, but it nests almost entirely in giant cactus, and there being none of these plants near our camp on the west side of the mountains, we saw no Arizona Crested Flycatchers there. Three specimens in all were collected, an adult male and two adult females (Nos. 29483-29485). For the use of the name *Myiarchus tyrannulus magister* see Hellmayr, 1927, p. 162.

59. **Myiarchus cinerascens cinerascens** (Lawrence)

A common species, mostly in the Lower Sonoran life zone, and seen by us in every section visited. Four specimens, two adult males and two adult females, were collected in the spring, three from the vicinity of Patagonia and one from the mouth of Stone Cabin Cañon, on dates ranging from May 11 to June 11 (Nos. 29486-29489). An adult male (No. 29893) taken near Patagonia on September 13, has nearly completed the annual molt.

60. **Myiarchus tuberculifer olivascens** Ridgway

This is a species primarily of the Upper Sonoran zone, scarcely venturing down into the areas where most of our work was carried on. There were a few still migrating when we arrived at the Ashburn Ranch, May 10, and several were seen or heard there during the next week. A few were observed near the mouth of Stone Cabin Cañon during the third week in June. One specimen was collected, an adult male taken on the Ashburn Ranch, May 14 (No. 29490). I am following Hellmayr (1927, p. 186) in using the name *Myiarchus tuberculifer olivascens*.

61. **Sayornis sayus sayus** (Bonaparte)

Fairly abundant and of general distribution in the valleys of southern Arizona. At our camp on the Ashburn Ranch a pair of Say Phoebes had a nest in the well, built in a crevice in the dirt wall about 15 feet down. This is a favorite nesting site with the species in this region and I have seen a number of nests similarly placed, in wells or in mine shafts The young of the birds under observation hatched out during the last week in May, judging from the actions of the parents. Two specimens of Say Phoebe were collected, adult female and male taken May 14 and 23, respectively (Nos. 29495-29496).

62. **Sayornis nigricans nigricans** (Swainson)

Not common. There was a nest in a barn on the Ashburn Ranch, and a few of the birds were seen elsewhere, always around human habitations.

Three were collected near Patagonia, one September 4, two September 15, and two in lower Madera Cañon, September 10 and 21, respectively (Nos. 29894-29896, 30272, 30273). These birds have just finished the molt, and the color of their fresh, unfaded plumage was so different from any California skins at hand as to warrant comparison with as much other material as could be assembled. Through the courtesy of the officials in charge, I was able to examine a series of 15 skins from central Mexican localities from the collection of the United States Biological Survey, a series of 25 from central Mexican localities from the collection of the Museum of Comparative Zoology, and specimens from northern Lower California from the collection of the Museum of Vertebrate Zoology.

The Arizona birds are slaty black, in notable contrast to the more brownish color of comparable California birds. It will be noted that this same slaty black coloration is the distinguishing feature of *Sayornis nigricans salictaria*, described by Grinnell (1927a, p. 68) from northern Lower California, based upon fresh-plumaged birds, and, in fact, the two series, from southeastern Arizona and from northern Lower California, are practically indistinguishable in appearance. Comparison with specimens from northern and central Mexico failed to disclose any from those regions of the same shade, though some were taken at the same season of the year. Mexican birds were essentially like those from California. It accordingly seems possible (in fact it seems to be the only explanation for the situation) that the slaty-black hue of freshly molted birds is an evanescent feature, fading quickly in life, and that in prepared skins this color alters appreciably in the course of years, even in tightly closed museum cases. My Arizona birds and Grinnell's "*salictaria*," collected recently, at the same season, are alike in slaty-black color. Central Mexican birds and Californian birds at hand that were taken at the same season of the year were all collected ten years ago or more and are again alike in their more brownish hue. Grinnell's (1927, p. 69) *brunnescens*, from the Cape San Lucas district, Lower California, based upon old skins, is characterized (in part) by relatively brownish coloration.

I at first inclined to the belief that the Arizona form rep-

resented the northern limits of *Sayornis nigricans nigricans*, of central Mexico, with the Pacific coast of California occupied by another subspecies, *S. n. semiatra* (see Nelson, 1900, p. 125), but in the light of the specimens here assembled, as described above, I can adopt no other course than to call them all by the one name, *nigricans*. The presence or absence of black streaking on the lower tail coverts, defined by Nelson as a differentiating character between *nigricans* and *semiatra*, I do not find to be of any subspecific value as between Arizona and California birds (see Brewster, 1902, p. 119; Ridgway, 1907, p. 598, footnote).

63. **Nuttallornis mesoleucus** (Lichtenstein)

A single bird, a late migrant, was collected on the Ashburn Ranch, May 12 (No. 29497). During the fall migration one was taken at Patagonia on September 22, one in Madera Cañon on September 24. For the use of the name *Nuttallornis mesoleucus* see Hellmayr, 1927, p. 189.

64. **Myiochanes richardsonii richardsonii** (Swainson)

A common summer bird of the Upper Sonoran zone in southern Arizona, and found by us in some numbers in the foothill region on both sides of the Santa Rita Mountains. The sycamores and other trees along the stream beds form the preferred habitat. Six specimens were collected: from the Patagonia region, May 23, August 31, September 5, October 8; from Madera Cañon, September 3 and 10 (Nos. 29498, 29898-29900, 30275, 30276).

65. **Empidonax difficilis difficilis** Baird

A summer visitant to the Transition zone of the mountains of southern Arizona. During May the species was migrating in the valleys, and a belated migrant was collected far from the mountains on the Santa Rita Range Reserve as late as June 7. One taken near the mouth of Stone Cabin Cañon on June 10 may have been nesting near by. During the fall migration the species was abundant on both sides of the Santa Ritas. Nineteen specimens

were collected, five on dates ranging from May 21 to June 10, 14 on dates ranging from September 4 to 28 (Nos. 29499-29503, 29901-29904, 30277-30286). An adult female shot September 7 has not yet begun the annual molt.

66. **Empidonax traillii brewsteri** Oberholser

Seen several times in the vicinity of Patagonia during the latter part of May. One was shot in Temporal Cañon (4500 feet altitude) on May 28, two near Patagonia on September 28, and one in Madera Cañon, September 17 (Nos. 29905-29906, 30287).

67. **Empidonax hammondii** (Xantus)

An adult male was collected seven miles north of Patagonia on May 12; two others were shot near Patagonia in the fall, on September 24 and October 3, respectively (Nos. 29504, 29907, 29908). The last taken specimen, an adult female, is apparently just beginning the annual molt.

68. **Empidonax griseus** Brewster

One bird, mostly in juvenal plumage (No. 29909), was collected at Fort Crittenden on September 19, the only time the species was encountered. The Gray Flycatcher is not known to breed anywhere in Arizona.

69. **Pyrocephalus rubinus mexicanus** Sclater

Abundant in the lowlands wherever there is water available. Pairs were spaced at frequent intervals along the water courses and they were about all the ranch houses, but the birds were seldom seen on the open cactus-covered mesa. A nest was found on the Sonoita on May 13, with three eggs nearly ready to hatch, in a cottonwood, 20 feet from the ground. It was a flimsy affair, and nearly hidden in the relatively large fork in which it was placed. Others found later were similarly placed and of similar construction.

The species was abundant about Patagonia at the end of August but had nearly disappeared before the end of

September. Last seen October 2. Seen only once in Madera Cañon, on September 21. Specimens taken early in September had almost or entirely finished the molt. Twenty specimens were collected, nine males and eleven females (Nos. 29505-29513, 29910-29919, 30288).

70. **Camptostoma imberbe** Sclater

Two birds, adult male and female (Nos. 29514, 29515), were collected by Mailliard and Gorsuch in Temporal Cañon (4800 feet altitude), May 20, and others were seen the same day. These may have been migrating, for subsequent visits to the cañon were fruitless, so far as this species was concerned. On September 13 Mailliard shot an adult female (No. 29920) two miles south of Patagonia. This bird has nearly finished the annual molt and is in fresh fall plumage, but it is very little different from the May specimens. It is slightly more yellowish below and more olivaceous above.

This little flycatcher is apparently one of the rarest of birds north of the Mexican boundary. In all probability it is a regular summer visitant to parts of southern Arizona, but, due to its unobtrusive nature and the small numbers in which it occurs, it has been overlooked by most collectors in that region.

Previous occurrences in Arizona known to me are as follows: Five specimens, adult and young, taken by F. Stephens near Tucson, during April and May, 1881 (Brewster, 1882, p. 208). These birds were collected, so Mr. Stephens told me, in the Santa Cruz River bottom, above San Xavier Mission, some ten to fifteen miles from Tucson. One specimen collected by F. Stephens "near Tucson" in April, 1884 (Bendire, 1895, p. 325). Two specimens, adult and young, collected by F. Stephens and H. S. Swarth at the same place on the Santa Cruz River as where Stephens' first birds were taken, June 11, 1903 (Swarth, 1905, p. 47). One specimen collected by R. D. Lusk, on the San Pedro River ten miles above its junction with the Gila, March 1, 1911 (Bailey, 1923, p. 32). One specimen, a young female, in the collection of J. Eugene Law (No. 8028, coll. J. E. L.), collected by Mr. Law at

Harrington's, on the old road between Vail and Benson, on the southeastern slope of the Rincon Mountains, September 5, 1919. One specimen in the Field Museum of Natural History, collected at Tucson, May 29, 1887. Three specimens in the collection of Dr. L. B. Bishop (Nos. 34848-34850, coll. L. B. B.), two males and a female, taken near Tucson on June 28, August 23, and July 10, 1922, respectively.

71. Otocoris alpestris adusta Dwight

East and northeast of the Santa Rita Mountains there are vast areas of grass land furnishing ideal surroundings for horned larks, which breed there in abundance. We found them in numbers in San Rafael Valley (about 5000 feet altitude), from which section open plains extend uninterruptedly toward the Huachuca Mountains and farther, into Mexico. A few horned larks were seen at old Fort Crittenden, and they were fairly numerous beyond this point, to the northward, along the road rounding that end of the Santa Rita Mountains.

On the west side of the mountains, this species is decidedly rare. I saw a few there in June, 1903 (Swarth, 1905, p. 79), but none on this visit. Even a scanty growth of widely scattered bushes suffices to keep them away. There are records of occasional birds seen about Tucson, but only in winter; the only ones that I, myself, have seen from there were of the more western subspecies, *leucansiptila*. West of Tucson there is little suitable country for horned larks until the Colorado River is crossed.

Nineteen adult specimens of the Scorched Horned Lark were collected during May (Nos. 29516-29534), one from a point seven miles north of Patagonia, May 22, the others from San Rafael Valley, May 23 and 25. Young birds were seen flying on the two latter dates.

In the fall there proved to be but a small proportion of *adusta* among the enormous flocks of horned larks that frequented the plains. The series collected at that time includes only six individuals that are referable to *adusta*, collected at various dates from September 1 to October 9 (Nos. 29988-29993). I found similar conditions existing

years ago near the Huachuca Mountains in the fall, that is, relatively few *adusta* among a preponderant number of *occidentalis*, indicating a deserting of the breeding grounds by *adusta* during the winter months.

72. Otocoris alpestris occidentalis McCall

Horned larks were found in large numbers in the fall in San Rafael Valley and on the grassy plains near Sonoita. Sixty-seven specimens (Nos. 29921-29987) that were collected upon various dates between September 1 and October 9 I have referred to the subspecies *occidentalis*. Some of the first taken birds are still in process of molt.

73. Cyanocitta stelleri diademata (Bonaparte)

Abundant in the Transition zone of the Santa Rita Mountains, but not seen in summer at the low level at which we were camped. Three adults were collected in Stone Cabin Cañon, at about 7000 feet altitude, on June 18 (Nos. 29535-29537).

74. Aphelocoma sieberi arizonæ (Ridgway)

A common bird in the Upper Sonoran oak-covered foothills of the Santa Rita Mountains. During May a few individuals wandered down into the bottom lands along the Sonoita, but none was nesting at so low an altitude. Present in fair abundance about our camp at the west base of the mountains, near the Florida Ranger Station. Thirty-three specimens were collected (Nos. 29538-29553, 29994-30005, 30289-30292), 24 from the east and nine from the west side of the mountains. In this species the bill is entirely black only at full maturity. In the young it is blackish above and mostly flesh-colored below, the black gradually spreading as the bird matures. More than a full year is required for the bill to become entirely black, and many birds taken in the spring and summer, otherwise adult in appearance, still have the parti-colored bill, a reliable indication of their age. Two such females collected on May 26, from the appearance of their ovaries evidently were not breeding,

and from the full-feathered condition of the lower parts just as evidently had not been sitting on eggs. So in some cases, at least, this species does not breed until two years old.

The type locality of *Cyanocitta ultramarina* var. *arizonæ* Ridgway, is Fort Buchanan, and there are certain interesting details regarding the discovery of the species at that place, as recounted by Florence Merriam Bailey (1923, p. 33, footnote). Most of our specimens from the east side of the Santa Ritas were collected within five miles of the site of Fort Buchanan, and some were shot from oak trees about the ruined buildings of Fort Crittenden, which had been established at a later date on practically the same spot as the older Fort Buchanan.

The series includes two nearly full-grown young, taken on May 26 and 30, respectively, birds still in juvenal plumage throughout as late as September 5, and others in the post-juvenal molt during the first week in October. The annual molt of the adult is also finished early in October.

75. Corvus corax sinuatus Wagler

Ravens were fairly common in the Sonoita Valley, but owing to the difficulty of distinguishing between *sinuatus* and *cryptoleucus* in life, it is impossible to state their relative abundance. My impression is, though, that *sinuatus* was the common form in this rather more wooded region, and that *cryptoleucus* replaced it entirely in the plains region immediately to the eastward. Neither species appeared to be nesting in May, or at any rate those seen were not so occupied. They were generally encountered in small flocks, six to ten in number. West of the Santa Rita Mountains ravens were less common, and there *sinuatus* was the only form definitely identified, recognized by its call note.

One specimen (No. 29554) was collected near Patagonia, June 2, and there is one other example from southern Arizona at hand, from the collection of G. Frean Morcom, taken by Frank Stephens near Tucson, June 4, 1903. Ravens of this species from southeastern Arizona may be assumed to belong to the subspecies *sinuatus*. These two birds are somewhat larger than ravens from southern California, as are several other Arizona specimens that I have handled.

The measurements given below, as far as they go, give some weight to Oberholser's (1918, p. 224) assignment of the subspecies *clarionensis* to the mainland of southern California, as compared with the larger *sinuatus* from points farther east, but the variation that may be encountered in one locality (see table below, and also Grinnell, 1914, p. 156) renders it unwise to generalize on a few specimens. The latest monographer of the group (Meinertzhagen, 1926) lumps *clarionensis* and *sinuatus*.

The ravens that I have examined from southeastern Arizona show the same feature that Grinnell (*loc.cit.*) notes on birds from the Colorado River, of greater whiteness at the base of the feathers of neck and upper breast, as compared with specimens from the Pacific slope of California. It might be desirable to recognize a coastal form, *clarionensis*, and a desert-inhabiting form, *sinuatus*, on the basis of the slight differences in color and average measurements just described. But in that case I could not follow Oberholser (*loc. cit.*) in his assertion of extensive overlapping of these subspecies in southern Arizona. I do not believe that more than one form of *Corvus corax* can be recognized there. This subspecies is continuously distributed and fairly abundant over the deserts of southeastern California and southwestern Arizona; it abruptly becomes rare when the grass land (the habitat of *Corvus cryptoleucus*) is reached in the southeastern corner of the latter state.

76. **Corvus cryptoleucus** Couch

A few White-necked Ravens were seen in San Rafael Valley on May 23 and 25, and a flock of fifty or more on September 1. The species was probably included among the many ravens seen near Patagonia. It has been previously reported from points immediately west of the Santa Rita Mountains, and we may have seen it there, too, but we did not positively recognize the species among the few ravens there observed. One specimen was collected, an adult female taken in San Rafael Valley, 15 miles east of Patagonia, May 25 (No. 29555).

Tucson and Oracle represent the westernmost points of record for this species in Arizona. It is not common west

Measurements in millimeters of *Corvus corax sinuatus* from southern Arizona, southern California, and Clarion Island

Collection	No.	Sex	Locality	Date	Wing	Tail	Culmen	Depth of bill	Tarsus
G. F. Morcom		♂	Tucson, Arizona	June 4, 1903	435.0	228.0	71.0	26.0	71.0
C. A. S.	29554	♂	Patagonia, Arizona	June 2, 1927	430.0	234.0	71.5	28.0	69.5
C. A. S.	18918	♂	Buttonwillow, Kern Co., Calif.	Nov. 6, 1914	380.0	201.0	63.5	25.5	63.0
C. A. S.	18919	♂	Buttonwillow, Kern Co., Calif.	Nov. 6, 1914	402.0	219.0	65.0	24.2	63.0
C. A. S.	18917	♀	Buttonwillow, Kern Co., Calif.	Nov. 23, 1914	389.0	219.0	61.0	25.0	63.5
C. A. S.	18920	♀	Buttonwillow, Kern Co., Calif.	Nov. 6, 1914	399.0	215.0	65.0	25.2	63.5
C. A. S.	28157	♂	Clarion Id., Revillagigedo Ids., Mex.	April 28, 1925	376.0	212.0	61.0	25.5	62.5
C. A. S.	28158	♂	Clarion Id., Revillagigedo Ids., Mex.	April 28, 1925	373.0	208.0	61.5	26.0	60.0
C. A. S.	28159	♀	Clarion Id., Revillagigedo Ids., Mex.	April 28, 1925	393.0	223.5	68.0	27.0	64.0

of the grass-covered plains of the extreme southeastern corner of the state.

77. **Molothrus ater obscurus** (Gmelin)

A common species in the lowlands of southern Arizona, and seen by us in some numbers in all sections visited. Early in May the Dwarf Cowbirds were not yet laying, judging from those we dissected. A non-breeding male shot on May 27 was in parti-colored plumage, with patches of glossy feathers interspersed among the duller colored first year feathers. This bird was not molting. Twenty-three specimens were collected, all from points near Patagonia (Nos. 29556-29574, 30006-30009). The series includes one bird in juvenal plumage, taken on September 6, and three adults nearly through the annual molt, taken on October 2.

78. **Tangavius æneus æneus** (Wagler)

It seems reasonable to believe that this species has entered Arizona during recent years. It was first reported by Visher (1909, p. 307) from the vicinity of Tucson, and has since been observed by others, there and elsewhere in southeastern Arizona, where, in fact, it is now an abundant summer visitant. That all of the earlier collectors in the state could have overlooked the bird seems unlikely in the extreme, and it is especially improbable that it could have escaped so keen an observer as Herbert Brown, who lived for years in a locality where this Cowbird is now abundant.

About Patagonia the Bronzed Cowbird was observed a day or two after our arrival on May 10, and in greatly increased numbers toward the end of the month. It was last seen September 6. Bands of six or eight attended individual horses or steers, often in company with Dwarf Cowbirds, trotting closely alongside the selected animal in order to take advantage of the small patch of shade it afforded, and showing a marked preference for feeding by the animal's head. On our several drives up and down the Santa Cruz Valley south of Tucson, Red-eyed Cowbirds were always seen, especially about irrigated sections. About our camp at the mouth of Stone Cabin Cañon, the species was not

abundant, but a few of the birds were seen at intervals throughout our stay. Females collected near Patagonia on May 19 contained partly formed eggs.

I was puzzled at first at a difference in the color of the eyes of different adult males. Later observation showed that although in a freshly killed adult male the eye was bright red, in an hour or two it had greatly faded, and by the time the specimen reached the skinning table the eye was an inconspicuous reddish brown. The females collected present a parti-colored effect, due to the head, neck and upper back, in varying degrees, being clothed in more recently acquired plumage than that covering the rest of the bird. They are not in process of molt, no pin feathers being present, but on the parts indicated the feathers are unworn and of soft gray or blackish coloration, in sharp contrast to the brownish and rather frayed plumage elsewhere. Nineteen specimens were preserved, nine adult males, nine adult females, and one juvenile (Nos. 29575-29590, 29592, 30010, 30011).

79. Agelaius phœniceus nevadensis Grinnell

Red-winged Blackbirds were found breeding in small numbers in the Sonoita Valley, and a series of 13 specimens collected, eight males, four females, and a juvenile female (Nos. 29591, 29593-29604). The young bird, just out of the nest, was taken on May 29.

In southeastern Arizona there are not many places suitable for *Agelaius*, but wherever a little marsh land or reed-grown ponds or reservoirs are found, small colonies become established. The birds are thus scattered at wide intervals over the southeastern portion of the state, and very possibly northward along its entire eastern boundary. This, the Red-winged Blackbird of eastern Arizona, is not the same as the subspecies occupying the Colorado Valley. Notable features of the Colorado Valley race are the long, slender bill, and (in the female) pale coloration. Conspicuous points of difference distinguishing the more eastern bird are the heavier, shorter bill, and the darker coloration of the female. This bird has been recorded several times as *neutralis* (see Swarth, 1914, p. 47), but it is not of that sub-

species, and comparison shows such close resemblance to a series of *Agelaius* from northern Nevada that I am placing the Arizona race under the same name, *nevadensis*. This form I am convinced occupies most, or all, of Arizona east of the Santa Catalina and the Santa Rita mountains.

The type specimen of *Agelaius phœniceus sonoriensis* unfortunately was collected within what I consider to be the breeding range of *nevadensis* in Arizona. This bird (coll. U. S. National Museum No. 49771, female [though marked "male" in two places on the label], collected at Camp Grant, 60 miles east of Tucson, Arizona, February 10, 1867) has been available to me for examination. It has also recently been the subject of careful study by A. J. van Rossem (1926, p. 227), who has pointed out certain peculiarities of the specimen. His suggestion that its true identity may lie in the direction of the later-described *fortis* may be correct, and at any rate serves to indicate the indeterminate nature of this unfortunately chosen type specimen. It differs from the mode of the *Agelaius* of the lower Colorado Valley, to which the name *sonoriensis* has been generally applied, in having a distinctly heavier, stubbier bill, in which particular it can not be matched in a large series of Colorado River birds. In coloration, however, it is closely similar to some females from the Colorado River, and correspondingly different from the mode of *nevadensis* and *fortis*. Altogether, I am disposed to let the name *sonoriensis* continue to stand for the Colorado River form, and to regard the type specimen as a stray or migrant, a winter-taken bird from beyond the normal breeding range of the subspecies. There has been already such a confusion of the names applied to this race, as well as to the proper type locality, that I am unwilling to suggest a change that might cause further trouble.

The point I wish to emphasize here is the fact that there are two subspecies of *Agelaius phœniceus* breeding in southern Arizona, one occupying the valley of the lower Colorado River and its tributaries as far east as Tucson, the other, the region east from the Santa Catalina and Santa Rita mountains. Breeding birds from Phoenix and Tempe are mostly indistinguishable from Colorado Valley specimens. Breeding birds from near Tucson are intermediate, some of

Measurements in millimeters of *Agelaius phœniceus nevadensis*

Collection	No.	Sex	Locality	Date	Wing	Tail	Culmen	Depth of bill	Tarsus
C. A. S.	29597	♂	Patagonia, Arizona	May 11, 1927	125.0	91.5	21.0	11.0	29.5
C. A. S.	29598	♂	Patagonia, Arizona	May 15, 1927	127.0	92.2	22.0	11.5	32.0
C. A. S.	29595	♂	Patagonia, Arizona	May 16, 1927	115.0	91.2	20.5	10.0	28.0
C. A. S.	29596	♂	Patagonia, Arizona	May 16, 1927	122.0	92.5	21.0	11.0	29.5
C. A. S.	29593	♂	Patagonia, Arizona	May 19, 1927	118.5	83.5	21.0	11.5	30.0
C. A. S.	29594	♂	Patagonia, Arizona	May 20, 1927	118.0	83.0	21.0	10.0	29.5
C. A. S.	29599	♂	Patagonia, Arizona	May 31, 1927	123.0	86.0	20.0	10.5	31.0
C. A. S.	29591	♂	Patagonia, Arizona	May 15, 1927	121.0	87.5	23.0	12.0	30.0
				Average	121.2	88.4	21.2	10.9	29.9
				Minimum	115.0	83.0	20.0	10.0	28.0
				Maximum	127.0	92.5	23.0	12.0	32.0

them having distinctly heavy and stubby bills, as compared with the slender-billed western race, but on the whole they are best associated with the Colorado Valley subspecies.

80. Sturnella magna hoopesi Stone

Meadowlarks were seen by us in San Rafael Valley on May 23 and 25, in pairs, widely spaced over the grassy plains. Later a number were seen at the northeastern base of the Santa Ritas, some miles north of Camp Crittenden. They were more abundant in both places at the end of the summer, in September and October. Specimens collected were all of the subspecies *hoopesi*, and I am satisfied that all the meadowlarks seen east of the mountains were of that form. The characteristic song of *neglecta* was never heard. There is a specimen of *neglecta* at hand, collected by D. M. Gorsuch near Patagonia, March 5, 1927, and I, myself, have taken the species in the fall somewhat farther east, near the Huachuca Mountains, but the facts suggest *neglecta* to be a winter visitant only in that part of Arizona.

Hoopesi has apparently an unusually protracted breeding season and a correspondingly lengthened period of plumage change. A female shot in San Rafael Valley on May 25 had laid part of its set, but on the same day a young bird was collected, nearly full-grown and able to fly. Other young birds, almost entirely or altogether in juvenal plumage were taken as late as October 4. An adult shot September 1 is still in worn breeding dress, having not yet begun the molt, and another collected October 4 is in the midst of the change, tail-less and scarcely able to fly. On the other hand, an adult taken September 14 is practically through the molt.

It seems impossible to indicate characters that will differentiate *hoopesi* and *neglecta* in all stages of plumage. Call notes and songs of the two are unfailing indicators in the field. In the adult bird the presence or absence of yellow on the malar region is the best single character, and it is one that is usually to be depended upon. *Neglecta* is not a grayer colored bird than *hoopesi*, though it has been so described. In fact, California examples of *neglecta* are generally of a decidedly richer brown. In *neglecta* the yellow

of the underparts is not paler than the average of *hoopesi*. Some fall specimens of *hoopesi* have the yellow decidedly of an orange hue, but this is not always the case, and such spring specimens of *hoopesi* as I have handled have the yellow about as in *neglecta*, paler than in most California examples of that species. Usually in fresh fall plumage *hoopesi* is more buffy on flanks and lower tail coverts than is *neglecta*. Juvenal-plumaged *hoopesi* and *neglecta* are not to be distinguished, so far as I can see. Length of tarsus, shorter in *neglecta*, longer in *hoopesi*, is the most reliable structural character that I have found.

We collected 35 specimens of *Sturnella magna hoopesi*, mostly from San Rafael Valley, a few from the vicinity of Sonoita (Nos. 29606-29611, 29615, 30021-30048).

81. **Sturnella neglecta** Audubon

As mentioned above, a specimen of *neglecta* (No. 30749) was shot by D. M. Gorsuch near Patagonia, March 5, 1927, the only record we have for the species on the east side of the Santa Ritas. In the Santa Cruz Valley a few meadowlarks were seen as we passed along the road some ten or twelve miles south of Tucson, and, though these were not specifically identified, it seems likely that they were *neglecta*, which has been found in that section before. *Hoopesi* has never been taken there.

We saw no meadowlarks on the Santa Rita Range Reserve while we were there in June. On the nearby mesa below the mouth of Madera Cañon, Miss McLellan saw none in the fall until October 7, on which day a number suddenly appeared. Two collected proved to be *neglecta* (Nos. 30293-30294).

82. **Icterus parisorum** Bonaparte

Our camp near Patagonia (elevation 4700 feet) was just below the level at which this species breeds in this region. The song was heard occasionally on the hillsides above, and now and then one of the birds was seen. At our camp at the west base of the mountains (elevation 4000 feet) conditions were about the same. Three specimens were

collected, all breeding males (Nos. 29612-29614). These are all in plumage stages intermediate between the juvenal and the full-plumaged male. It is a curious fact that in southern Arizona, while high-plumaged birds preponderate when the species first arrives from the south, in March and April, breeding birds are, in my experience, almost all in the imperfect, presumably immature, stage. A corresponding stage exists in the males of the other two orioles in this region, *nelsoni* and *bullocki*, but not nearly so commonly. High-plumaged birds are in the majority in those two species.

83. **Icterus cucullatus nelsoni** Ridgway

Present in small numbers in the vicinity of Patagonia; abundant in the lowlands at the west base of the Santa Ritas. Thirteen specimens were collected (Nos. 29616-29628), consisting of five fully mature males, two males breeding but in imperfect plumage, and six adult females.

84. **Icterus bullockii** (Swainson)

A common species in the Patagonia region, frequenting mostly the rows of cottonwoods and sycamores along the stream beds. On the west side of the mountains the Bullock Oriole was much less abundant, thus reversing conditions as observed in the Arizona Hooded Oriole. Five specimens were collected (Nos. 29629-29633), three high-plumaged males, one breeding male in immature plumage, and one adult female, all taken near Patagonia.

85. **Euphagus cyanocephalus cyanocephalus** (Wagler)

An adult female (No. 29605) was taken on the Ashburn Ranch, May 13. Exact manner of occurrence of the species there can not be stated, as it was some days before I realized that the small companies of black birds we were seeing were Bronzed Cowbirds, not the Brewer Blackbird. The species is doubtless a winter visitant to the region, and the one bird collected was probably a straggler that had lingered after most of its kind had gone on. In the fall a few were seen

near Fairbank on September 26. About Patagonia flocks were passing through, apparently migrating, during the first week in October.

86. **Passer domesticus** (Linnæus)

Present in fair abundance in the Patagonia region. To be seen everywhere about human habitations, and some birds were even noted carrying building material into cottonwood trees far removed from any houses. Much less common at the west base of the Santa Ritas, where, in fact, only a few were seen. In southern Arizona generally the species has arrived everywhere where conditions are satisfactory. This general dispersal has been accomplished within the last 25 years (see Swarth, 1914, p. 50).

87. **Carpodacus cassinii** Baird

A common winter visitant to southern Arizona, mostly in the mountains. One specimen (No. 29634), an adult female, taken near Patagonia, May 20, was the only one seen. This bird had undoubtedly lingered beyond the usual time of departure.

88. **Carpodacus mexicanus frontalis** (Say)

Present in fair abundance both in the Patagonia region and at the west base of the mountains. Full-grown young were flying about by June 1. Four specimens collected (Nos. 29635-29637, 30295), an adult male, adult female, juvenile female, and an (apparently) immature male. The last mentioned specimen, collected October 11, is in an unusual plumage for this species. It is a male bird that has passed beyond the juvenile stage but has not acquired the usual red plumage. It is in the streaked female plumage but with small patches of red, little more than traces, on breast, top of head, and rump.

89. **Astragalinus psaltria hesperophilus** Oberholser

Present in fair abundance, and breeding, in the Sonoita Valley near Patagonia, in lesser numbers at the west base

of the Santa Ritas. Ten specimens were preserved (Nos. 29638-29640, 30049-30055): In the early summer two adult males and one full-grown juvenile, the latter collected on June 5; in the fall seven specimens, on dates ranging from August 29 to October 8. Arizona examples of this species are to my eye indistinguishable from Californian specimens. In both regions partly black-backed individuals occur, such as served as a basis for the name *arizonæ*. I do not believe that increasing age brings on an increased amount of the black, but rather that it is individual variation and that it becomes rather more common toward the east.

90. **Spinus pinus pinus** (Wilson)

A few Pine Siskins still lingered in the vicinity of Patagonia during the month of May, two specimens (Nos. 29641, 29642), collected May 19 and 21, respectively, being the last that were seen. Siskins from southern Arizona average rather paler colored and are less heavily streaked below, as compared with specimens from the Pacific coast. These differences may indicate an approach toward the Mexican subspecies, *macropterus*, but I can not detect any corresponding variation in size. In southern Arizona, moreover, the Pine Siskin occurs only as a winter visitant, and such birds may, of course, have come from some region far to the northward. Definite breeding records in Arizona are all from the Mogollon Divide and northward. There is apparently an hiatus here between the southern breeding limit of *S. pinus pinus* and the habitat of *S. pinus macropterus*, of Mexico.

91. **Calcarius ornatus** (J. K. Townsend)

A migrant and winter visitant in southeastern Arizona. First appeared in San Rafael Valley October 9, seen there again in some numbers on October 10, and near Sonoita on October 11. Twelve specimens were collected (Nos. 30056-30067).

92. **Poœcetes gramineus confinis** Baird

Seen during the fall migration, when it appeared in abundance on the mesa below Madera Cañon, and in the vicinity of Patagonia. Fourteen specimens were collected at each of these localities, 28 in all (Nos. 30068, 30069, 30071-30082, 30296-30309), on dates ranging from September 13 to October 11.

93. **Passerculus sandwichensis nevadensis** Grinnell

Among the swarms of sparrows that appeared in the fall in the grassland east of the Santa Ritas there were some Savannah Sparrows. Five specimens were collected, two in San Rafael Valley, three near Sonoita, between September 14 and October 11 (Nos. 30070, 30083-30086). All are of the subspecies *nevadensis*.

94. **Ammodramus bairdii** (Audubon)

Two specimens collected in San Rafael Valley, a molting and very ragged adult on October 1, another nearly through the molt, October 10 (Nos. 30087, 30088). The species has been reported as occurring in large numbers in this part of Arizona in the fall (Henshaw, 1875, p. 253) and in the spring (Swarth, 1904, p. 38). It has not been found anywhere west of the Santa Rita Mountains.

95. **Ammodramus savannarum bimaculatus** Swainson

We found a few Western Grasshopper Sparrows in San Rafael Valley, 15 miles east of Patagonia, May 23 and 25. There were swales in which there was a fairly dense growth of tall "bunch-grass," and the birds could not be forced to leave this shelter. In the fall they were found in the same place, and also near Sonoita. There are previous records by Henshaw (1875, p. 25) and by Nelson (see Bailey, 1923, p. 38) of midsummer occurrences in the Sonoita Valley. We collected eight specimens (Nos. 29643-29646, 30089-30092): four adults, not yet breeding, May 23 and 25; two in juvenal plumage, September 7, October 4; a molting

adult, October 10; one in fully acquired winter plumage, October 6.

96. **Chondestes grammacus strigatus** Swainson

Common in the vicinity of Patagonia and elsewhere in the Sonoita Valley. Three specimens collected there in May (Nos. 29647-29649). Not seen at the western base of the Santa Ritas during June, but one specimen collected below Madera Cañon on September 27 (No. 30310).

97. **Zonotrichia leucophrys** (Forster)

Fairly common in the Sonoita Valley early in May, being one of the last of the migrants to depart. Last seen May 24. Three specimens collected (Nos. 29650-29652). An immature female was collected below Madera Cañon, October 6 (No. 30312).

98. **Zonotrichia gambelii** (Nuttall)

First seen at the western base of the Santa Ritas, below Madera Cañon, on September 27, and found in increasing numbers soon after. Immatures were greatly in excess of white-crowned adults. Five specimens collected, between September 27 and October 5 (Nos. 30311, 30313-30316). For my reasons for using the binomials, *Zonotrichia leucophrys* and *Z. gambelii*, see Swarth, 1926, p. 123.

99. **Spizella passerina arizonæ** Coues

Does not breed in southern Arizona but appears in numbers toward the end of the summer. One of the most abundant of birds during September and October about Patagonia and in Madera Cañon. There were many streaked juveniles in the first arriving flocks. A few individuals had finished the post-juvenal molt by the middle of September, but these were exceptions. An adult collected on September 17 had hardly begun to molt and molting birds were collected throughout September and in early October. Eighteen specimens were taken in the Patagonia region, and 35 in and

below Madera Cañon, on dates ranging from September 2 to October 10 (Nos. 30093-30110, 30328-30362).

100. **Spizella breweri** Cassin

A very few, the last departing migrants, were seen near Patagonia in May, the last on May 15. In the fall they returned in large numbers, both at Patagonia, east of the Santa Ritas, and below Madera Cañon, on the west side. Eighteen specimens were collected, one on May 12, the others between August 30 and October 12 (Nos. 29653, 30111-30117, 30317-30327).

101. **Junco phæonotus palliatus** Ridgway

A common species in the Santa Rita Mountains at a higher altitude than that where most of our collecting was carried on. Seven specimens were collected in Madera Cañon during September (Nos. 30363-30369).

102. **Amphispiza bilineata deserticola** Ridgway

Fairly common on the rocky hills bordering the Sonoita Valley near Patagonia. Abundant at the west base of the Santa Ritas, on the Santa Rita Range Reserve and throughout the valley below. Young out of the nest were collected on June 5 and a bird still in juvenal plumage was taken September 23. The fall molt lasts well into October. Twenty-two specimens were collected (Nos. 29654-29659, 29692, 30118-30120, 30370-30381).

103. **Peucæa cassinii** (Woodhouse)

Not seen during May and June. In the late summer, eight specimens (Nos. 30121-30128) were taken within ten or twelve miles of Patagonia between August 27 and September 23. Six (Nos. 30382-30387) were collected below the mouth of Madera Cañon on September 27 and 28; they seemed to be present there only during two or three days. The species has not been proven to breed in southern Arizona, and this series does not definitely settle the question.

If it were not for the fact that we failed to find this bird in May and June (and I was searching for it over the exact ground where it was found in the fall) I would have assumed that the series taken in August and September were certainly representative of a breeding species. One bird collected on August 27, just beginning the annual molt, is marked as having "testes still fully enlarged," and adults and young collected during September are variously advanced in the molt. It seems likely, though, that the species is a migrant here from some more northern point.

It is noteworthy that neither *Peucæa botterii* nor *Aimophila carpalis* were seen by us though we were in the exact region where both had been found in abundance in years past. So far as I know neither species has been observed in Arizona for many years. These species of *Peucæa* and *Aimophila* occupied the grass-grown lowlands, and it is possible that the over-grazing of this region which had for one result the disappearance of *Colinus ridgwayi* also brought about the local extinction, or near-extinction, of the less conspicuous sparrows. *Peucæa cassini*, apparently not a breeding species, returns on migration, but the others, deprived of shelter on their nesting grounds, seem to be gone, or, at any rate, to have become extremely scarce.

104. **Aimophila ruficeps scottii** (Sennett)

The Sonoita Valley is just below the breeding limit of this species, which is primarily a bird of the Upper Sonoran zone. A few were seen in Temporal Cañon and elsewhere in the surrounding hills, and some were found also near the western base of the Santa Ritas, in Sawmill, Stone Cabin and Madera cañons, above 4000 feet. Birds in juvenal plumage were taken as late as September 14, and an adult not yet beginning the annual molt on September 13. Ten specimens were collected, including three juveniles (Nos. 29660-29662, 30129-30132, 30388-30390).

105. **Melospiza melodia saltonis** Grinnell

We found song sparrows only in the river bottom a few miles below Patagonia, where an abundance of tangled

vegetation, long grass and running water made a favorable combination that was not encountered elsewhere. Four specimens were collected there on June 1, two adults and two juveniles, and five more between September 2 and October 8 (Nos. 29663-29666, 30133-30137). Young in juvenal plumage throughout were taken as late as September 15.

These birds are darker colored and more heavily streaked on the breast than comparable specimens from the Colorado River. I have collected similarly dark-colored song sparrows near Fairbank, on the San Pedro River, some 30 miles northeast of Patagonia, and these two localities may be regarded as close to the eastern limit of the range of the subspecies *saltonis*.

106. **Melospiza melodia fallax** (Baird)

One specimen collected near Patagonia, October 8 (No. 30138). This subspecies occurs as a winter visitant in southern Arizona. For use of the name *fallax* for the Rocky Mountain Song Sparrow see Grinnell, 1914, p. 174.

107. **Melospiza lincolnii lincolnii** (Audubon)

A common migrant and winter visitant. Four specimens collected near Patagonia, between September 21 and October 7 (Nos. 30139-30142).

108. **Pipilo fuscus mesoleucus** Baird

A common species in the foothills and at the base of the mountains on both sides of the Santa Ritas. The nesting season is evidently a long one; a male taken September 8 had testes still in breeding condition. On May 11 a nest was found containing three fresh eggs, and at the same time nearly full-grown young were flying about. A nest in course of construction was found on May 20. Such nests as I saw were in willow or mesquite, from five to seven feet above the ground. On the Santa Rita Range Reserve, several miles from the mountains, during the third week in June, Cañon Towhees were abundant and in loosely assembled

flocks of as many as eight or ten birds. A young bird still in juvenal plumage was collected on September 18; the annual molt of the adults is not finished until nearly the middle of October. Twenty-nine specimens were collected (Nos. 29667-29679, 30143-30152, 30392-30397).

109. **Oberholseria chlorura** (Audubon)

A late migrant through southern Arizona in the spring. A few stragglers were seen at intervals near Patagonia during the first three weeks in May, the last on May 20. They re-appeared in numbers early in September on both sides of the mountains. Eight specimens were collected, two in May, six between September 7 and October 3 (Nos. 29680, 29681, 30153-30156, 30398-30400).

110. **Cardinalis cardinalis superbus** Ridgway

Abundant in the western foothills of the Santa Rita Mountains. Not seen by us in May in the Sonoita Valley; so far as I know the species has not been found breeding east of this point in southern Arizona. At the western base of the Santa Ritas a nest was found on June 7 at the mouth of Stone Cabin Cañon, placed on a branch of a mesquite, about six feet from the ground. It contained two young birds, probably about a week old. Four specimens were collected near Patagonia in the fall, three on September 9, one on October 5. A young male shot September 9 is in the midst of the post-juvenal molt, with large tracts of red plumage. The bill is still black. An adult female taken the same day is also ragged with molt, and an adult male taken October 5 has nearly completed the molt. Sixteen specimens in all were collected (Nos. 29682-29691, 30157-30160, 30547, 30548).

111. **Pyrrhuloxia sinuata sinuata** (Bonaparte)

Seen at various points at the north end and along the western base of the Santa Rita Mountains, but nowhere as abundantly as the Arizona Cardinal, which it resembles so closely in general appearance and in habits. On June

8, five adult males were seen chasing each other through a mesquite thicket. Two specimens were collected, adult males, taken near the mouth of Sawmill Cañon (Nos. 29693, 29694).

112. **Hedymeles melanocephalus melanocephalus** (Swainson)

The Sonoita Valley is probably just below the lower limit of the breeding range of this species, but migrating individuals passed through there in numbers during the first three weeks in May. At the same time others were nesting in the surrounding cañons at only a slightly higher level. A nest found in Temporal Cañon on May 20, contained three eggs. It was the usual flimsy structure, placed near the end of a drooping sycamore limb, about 12 feet from the ground. Fairly common in September, both at Patagonia and in Madera Cañon. Twelve specimens collected, seven adults in early summer, five immatures in the fall, between August 28 and September 21 (Nos. 29695-29701, 30161-30163, 30401, 30402).

113. **Guiraca cærulea interfusa** Dwight & Griscom

A common summer visitant in southern Arizona to such lowland localities as have some running water. The first arrival was seen near Patagonia on May 14, and increasing numbers appeared during the next two weeks. The species was present, but not common, at the western base of the Santa Rita Mountains, where specimens were taken near the Florida Ranger Station. A few were seen along the road side in irrigated sections of the Santa Cruz Valley during June; the species is known to be fairly abundant there. The latest fall specimen was taken near Patagonia on September 28. An adult male shot on August 28 has not begun the post-nuptial molt. Young males taken September 5 and 28 are in first winter plumage throughout. Twelve specimens collected, eight adult males, one adult female, three immature males (Nos. 29702-29709, 30164-30167). I am following Dwight and Griscom (1927, p. 4) in applying the name *interfusa* to the Arizona race of the Blue Grosbeak.

114. **Passerina amœna** (Say)

Migrating commonly in the Sonoita Valley. First seen on May 12, and abundant a few days later. An adult male observed at the Florida Ranger Station on June 16 may have been an indication that the species was nesting there, farther south in Arizona than it has yet been found breeding. An adult male and two adult females were collected in the vicinity of Patagonia, May 19 and 27 (Nos. 29710-29712), seven more between August 30 and October 3 (Nos. 30168-30174). Young birds mostly in juvenal plumage were shot early in September. An adult male taken September 28 and a female on October 3 have nearly finished the molt. In the male bird the blue body color is almost entirely hidden by brown feather tips. Wearing away of these tips would reveal the usual summer plumage.

115. **Spiza americana** (Gmelin)

An immature female (No. 30175) was collected by Mailliard four miles south of Patagonia on September 24. The species has previously been recorded from Arizona by Henshaw (1875, p. 295), who took specimens on the San Pedro River, at Fort Crittenden and at Fort Lowell, in August and September, 1873 and 1874; and by Scott (1887, p. 205), from a specimen taken by Herbert Brown at Tucson, September 11, 1884.

116. **Calamospiza melanocorys** Stejneger

A flock of 300 or more seen near Continental on September 25, and two birds at a point five miles north of Patagonia on October 13. A common winter visitant to the region.

117. **Piranga ludoviciana** (Wilson)

Migrating commonly along the Sonoita Valley during the middle of May. Common until May 20, and one bird collected as late as May 28. Three specimens were preserved, two males and one female. Seen again in the fall,

when specimens (all birds of the year) were collected at Patagonia, August 28 to September 11, and in Madera Cañon, September 4 to 15. Ten specimens in all were collected (Nos. 29713-29715, 30176-30179, 30403-30405).

118. **Piranga hepatica oreophasma** Oberholser

This is a species mostly of the Transition zone, and its occurrence in the foothills near Patagonia was merely as a migrant, and a rather uncommon one. It was not seen on the floor of the valley, but usually in the oaks of the surrounding hills. A female collected in Temporal Cañon (altitude about 4500 feet) on May 28 was evidently incubating eggs at the time. The species was seen occasionally in the cañons at the western base of the Santa Rita Mountains in June, and fairly commonly in Madera Cañon in the fall. Five specimens were collected in May and June, three red-plumaged males, one male, adult but in female plumage, and one adult female (Nos. 29716-29720). Six collected in Madera Cañon between September 8 and 25 (Nos. 30406-30411) are all nearly through the molt.

119. **Piranga rubra cooperi** Ridgway

An abundant species in the Sonoita Valley and but little less so at the western base of the Santa Ritas. Near Patagonia mating was going on during the second week in May, the birds frequenting mostly the rows of large cottonwoods and sycamores along the stream beds. Although the species is so common there, that section marks practically the eastern limit of the breeding range in southern Arizona. At the base of the Huachuca Mountains, some 30 miles east of Patagonia, the Cooper Tanager occurs as an uncommon migrant; there are no breeding records from that range.

Sixteen specimens were collected in the early summer, twelve males and four females (Nos. 29721-29736). These are all breeding adults, but one of the males is almost indistinguishable from females, having just a few pale red feathers scattered over head and body, a second has somewhat more of such reddish areas, while a third has the

throat, pileum, intercapulars, and tail as brilliantly red as in the fully mature male, the red areas being sharply defined against the generally yellowish body coloration. The remaining nine male birds are in uniformly bright red plumage. None of the parti-colored birds is in process of molt. It has been assumed that this imperfect plumage is a sign of immaturity and that several years are required for its perfection. This may be true, but I do not think that it has been proved. The parti-colored birds are relatively rare, not nearly so common as the red males, and if each individual passed through the same sequence of plumages the mottled birds should be the more numerous.

Ten were collected near Patagonia in the fall, between August 28 and October 7 (Nos. 30180-30189). Two males, shot August 28 and 31, respectively, are changing from yellow to red plumage, and on these birds there are remnants of yellow over all parts. Fully mature males, red throughout, and nearly or quite through the annual molt, were taken September 6 and 28, and October 7. Immature birds, entirely through the post juvenal molt, were collected August 28 and 29.

120. **Petrochelidon lunifrons melanogastra** (Swainson)

A few cliff swallows were nesting on buildings in the town of Patagonia and elsewhere in the valley, and they were abundant there during the first half of September. Four specimens (Nos. 30190-30193) were collected near Patagonia on August 31, one adult male in worn breeding plumage and three young birds. These skins are not such as to show subspecific characters very well, but there is a series of breeding birds in the collection of Dr. L. B. Bishop from this same region, unmistakably of the subspecies *melanogastra*.

121. **Hirundo erythrogastra** Boddaert

A fairly common summer visitant to southern Arizona, mostly about human habitations. Seen in and about Patagonia until the middle of September. Two specimens collected on September 16 (Nos. 30194-30195).

122. **Tachycineta thalassina lepida** Mearns

Abundant about Patagonia during the first two weeks in September. Two young birds (Nos. 30196, 30197) were collected on September 7 and 10, respectively.

123. **Stelgidopteryx serripennis** (Audubon)

Found nesting, or preparing to do so, along various dry stream beds in the Sonoita Valley. A female collected on May 22 had laid part of its set. Two specimens collected (Nos. 29737, 29738).

124. **Bombycilla cedrorum** Vieillot

Two birds, presumably a pair, seen, and one (No. 29739) collected, on the Ashburn Ranch, May 29. These were probably late migrants or winter visitants; the species is not known to breed in this region.

125. **Phainopepla nitens** (Swainson)

Present in small numbers about Patagonia when we arrived early in May, and increasing greatly toward the end of the month. On the west side of the mountains, in June, flocks of Phainopeplas (loose assemblages of 20 or 30 individuals) appeared every afternoon, flying up Stone Cabin Cañon. Six specimens collected (Nos. 29740, 29741, 30412-30415), including four males in fresh fall plumage that were taken below Madera Cañon, October 10 to 13.

126. **Lanius ludovicianus excubitorides** Swainson

A rare bird in the vicinity of Patagonia, where it was seen on but a few occasions. West of the mountains, on the Santa Rita Range Reserve, shrikes were present in fair abundance. During the second week in June several broods of young were encountered, evidently just out of the nest. Seven specimens were collected there, three adults and four juveniles (Nos. 29742-29748). The old birds (June 10, 13, 13) are in badly worn plumage but not

yet beginning to molt. The young (June 8, 14, 16) are in juvenal plumage throughout. In the fall a molting adult was taken near Patagonia, September 8, and two immatures below Madera Cañon, September 26, and October 1, respectively (Nos. 30198, 30416, 30417).

127. **Vireosylva gilva swainsonii** (Baird)

A few seen, presumably migrating, near Patagonia, the last on May 21. Abundant in the fall, when two specimens were taken near Patagonia and six in Madera Cañon on various dates between September 5 and 21 (Nos. 30199, 30200, 30418-30423). An adult shot September 5 had not yet begun the annual molt.

128. **Lanivireo solitarius cassinii** (Xantus)

A common migrant. One specimen collected at Fort Crittenden, September 19, and nine in Madera Cañon, between September 13 and 26 (Nos. 30201, 30424-30432).

129. **Lanivireo solitarius plumbeus** (Coues)

One specimen (No. 30433) taken in Madera Cañon on September 20. This probably is about as late a date as the species remains.

130. **Vireo huttoni stephensi** Brewster

One bird collected at the lower edge of the oak belt on the Ashburn Ranch, May 21, and one in Madera Cañon, September 19 (Nos. 29749, 30434).

131. **Vireo belli arizonæ** Ridgway

Rather uncommon in the Sonoita Valley. At the western base of the Santa Ritas this is a common bird, and individuals were heard singing on all sides in the mesquite thickets. The preference the Arizona Least Vireo shows

for mesquite-bordered dry washes is a life history trait that contrasts strongly with the California Least Vireo's choice of willow-grown bottom lands. In the Sonoita Valley near Patagonia there are willow bordered streams, such as the California bird frequents, but Least Vireos were decidedly rare there, in contrast to their abundance in mesquite thickets elsewhere. Three adults were collected in June below Sawmill Cañon, and one in Madera Cañon, September 16 (Nos. 29750-29752, 30435). These and other Arizona specimens at hand bear out the validity of the subspecies *arizonæ*, as yet not recognized in the A. O. U. *Check-list*.

132. **Vermivora luciæ** (J. G. Cooper)

Abundant in the Sonoita Valley near Patagonia, and somewhat less numerous at the west base of the Santa Rita Mountains. A nest with four eggs was taken on the Ashburn Ranch, May 19. It was in a hole (apparently an old knot hole) in the trunk of a mesquite, three and one-half feet from the ground. The hole was about 1¾ inches across, and about 3 inches high. The nest, about 1½ inches in diameter, was only an inch or so within the opening, and the eggs could be seen from outside. The nest was composed of shreds of dry mesquite bark, some feathers, and mammal fur. Six skins of the Lucy Warbler were preserved, two males and six females, all adult (Nos. 29753-29758).

133. **Vermivora ruficapilla gutturalis** (Ridgway)

A common migrant. Five specimens from Patagonia and six from Madera Cañon, on various dates from August 31 to September 27 (Nos. 30202-30206, 30436-30441).

134. **Vermivora celata lutescens** (Ridgway)

Two collected near Patagonia on the fall migration, on September 16 and October 3, respectively (Nos. 20307, 20308).

135. **Dendroica æstiva sonorana** Brewster

136. **Dendroica æstiva brewsteri** Grinnell

Yellow warblers were seen daily during May in the Sonoita Valley, but not in any numbers. *Brewsteri* was migrating through the region at the time, and of the five yellow warblers collected, four (Nos. 29759-29762) proved to be of this subspecies. These were taken May 12, 13, and 15. One specimen of *sonorana*, a breeding bird, was shot on May 18 (No. 29763); an adult male in fresh fall plumage was taken on August 31 (No. 30209). Migrating examples of *brewsteri* were collected in Madera Cañon on September 6 and 15 (Nos. 30442, 30443).

137. **Dendroica auduboni auduboni** (J. K. Townsend)

A few migrants were still passing through the Patagonia region during the second week in May. Two specimens were collected on May 14 (Nos. 29764, 29765). Last seen on May 15.

138. **Dendroica nigrescens** (J. K. Townsend)

Breeds commonly in the live-oak belt. Three specimens (Nos. 30444-30446) collected in Madera Cañon in the fall, the last on October 10. This is, perhaps, as late a date as the species has been reported in southern Arizona.

139. **Dendroica townsendi** (J. K. Townsend)

A few migrating individuals seen early in May. Last observed May 17.

140. **Oporornis tolmiei** (J. K. Townsend)

Migrating in small numbers early in May. One specimen collected on May 13, the last observed (No. 29766). Abundant in the fall. Six taken near Patagonia and two in Madera Cañon, from August 28 to September 29 (Nos. 30210-30215, 30447, 30448).

141. Geothlypis trichas scirpicola Grinnell

142. Geothlypis trichas occidentalis Brewster

The breeding yellowthroat of southern Arizona is distinguishably different from the migrant that passes through the region. To the breeding bird I have in previous publications applied the name *scirpicola* (Swarth, 1912, p. 71), as I do here, in order to indicate this difference, but this is an unsatisfactory arrangement. Specimens are hard to obtain and there are few available. I feel that an adequate series might show the yellowthroat of southeastern Arizona to belong to the form *melanops*, of the Mexican plateau. An adult male collected by myself on the San Pedro River, July 6, 1902, and sent at that time to Mr. Ridgway for his inspection was pronounced by him as "approaching *Geothlypis trichas melanops*." (In this connection see also Ridgway, 1902, p. 674, footnote.) It is a large, bright colored bird, with the lower parts almost entirely yellow.

A few pairs of yellowthroats occupied the limited areas where suitable surroundings exist in the vicinity of Patagonia. An adult female was taken in tules bordering one of the small lakes on the Ashburn Ranch on May 24, another along the Sonoita three miles south of Patagonia, on June 1 (Nos. 30739, 30740). Two adult males that were collected near Patagonia on September 15 are in the midst of the annual molt (Nos. 30216, 30217). The migrating form (*occidentalis*) was sparingly present in the Sonoita Valley early in May. Two specimens (Nos. 29767, 29768) were collected, the last on May 19.

143. Icteria virens longicauda Lawrence

A common bird in the Sonoita Valley. Not often seen, but in full song and heard daily at many different points. Five specimens collected: three adults taken in May; a young bird in the post-juvenal molt, September 2; an adult nearly through the annual molt, September 9 (Nos. 29769-29771, 30218, 30219).

144. **Wilsonia pusilla pileolata** (Pallas)

145. **Wilsonia pusilla chryseola** Ridgway

This species (represented most abundantly by the subspecies *pileolata*) is a common migrant in southern Arizona. It passes through later in the spring than most transients, and was seen in some numbers near Patagonia during May, when three specimens of *pileolata* (Nos. 29772-29774) were collected. In the fall, at the same place, six specimens of *pileolata* (Nos. 30222-30227) and two of *chryseola* (Nos. 30220-30221) were taken from August 28 to September 15. In Madera Cañon, September 7 to 26, five specimens of *chryseola* (Nos. 30449-30453) and two of *pileolata* (Nos. 30454, 30455) were secured.

146. **Setophaga picta** Swainson

A common species in the Transition zone of the Santa Rita Mountains. Seen by our party whenever individuals ascended the cañon above the Florida Ranger Station to a level a few hundred feet above our camp. Full-grown young were flying about during the first week in June. Abundant in Madera Cañon during September. By September 1 young birds had all passed through the post-juvenal molt and were indistinguishable from adults. One specimen taken near Patagonia, September 15. Thirteen specimens in all were preserved (Nos. 29775-29777, 30228, 30456-30464).

147. **Mimus polyglottos leucopterus** (Vigors)

Abundant everywhere in the lowlands. About Patagonia and at the west base of the Santa Ritas the Mockingbird was one of the most common birds. Numerous below Madera Cañon in the fall, when two were taken, on October 10 and 12, respectively. Five specimens in all were collected (Nos. 29778-29780, 30465, 30466).

148. **Toxostoma curvirostre curvirostre** (Swainson)

149. **Toxostoma curvirostre palmeri** (Coues)

Thrashers of this species occur in small numbers in the Sonoita Valley and elsewhere eastward from the Santa Ritas, in great abundance from the western base of the mountains westward. J. Eugene Law (1928, p. 151) has called attention to the fact that the form occurring in the southeastern corner of Arizona is *curvirostre*, and not *palmeri*, which assertion is borne out by the material we collected. Ten specimens were taken in the Patagonia region, two males and two females, adult, in May, three males and one female, adult, in September and October, and two in juvenal plumage, one shot May 14, the other September 6; and four were collected at the west base of the Santa Ritas, two adults in October and two juveniles in June (Nos. 29781-29787, 30229-30233, 30467, 30468). For the purpose of this study this series has been supplemented by additional specimens from Tucson and from points in Cochise County, in extreme southeastern Arizona.

Differences between the two lots, east and west of the Santa Ritas, are, in most cases, fairly apparent, especially so in the freshly assumed fall plumage. The eastern birds (*curvirostre*) are rather more slaty above, have fairly well marked white wing bars, have sharply defined white tips to the outer rectrices, and the breast spots are large and fairly well defined. The western birds (*palmeri*) are browner above, lack the wing bars, have the tail spots obscurely indicated or else entirely wanting, and have the breast spots less distinct. There are some anomalous specimens at hand from points east of the mountains that may be explained as illustrating intergradation between two closely related subspecies, or, perhaps, as being wanderers (they were taken out of the breeding season) from their normal habitat. As a rule, though, birds from the two regions are sufficiently unlike to justify Law's (*loc. cit.*) disposition of them. It will be noted that the eastern boundary of *Toxostoma c. palmeri*, as here restricted, is the same as that of *Toxostoma bendirei*.

On May 13 a nest of *curvirostre* was found near Pata-

gonia containing three eggs, nearly ready to hatch; at the same time full grown young were seen. On May 28 a set of four eggs was taken. As a bird in juvenal plumage was collected on September 6, the nesting season is obviously of long duration. On June 5 a nest of *palmeri* was found containing newly hatched young. In nestlings the iris is whitish, changing to yellow during the post-juvenal molt.

150. **Toxostoma bendirei** (Coues)

Not seen on the east side of the Santa Rita Mountains. On the mesa at the western base of the range the species was probably fairly numerous, but owing to its close resemblance to the more abundant *palmeri* it was not possible to make sure of the identity of all the thrashers that were seen. One specimen of *bendirei* was preserved (No. 29788), a male shot on June 9, mostly in juvenal plumage.

151. **Toxostoma crissale crissale** Henry

The Crissal Thrasher is not nearly so generally distributed as are the Palmer and Bendire thrashers, and it is also much more secretive in its habits. Not seen by us in Sonoita Valley. Neither did we find it upon the cholla-covered mesa below the western base of the Santa Ritas, but it was discovered in some mesquite-grown washes at the mouth of Sawmill Cañon. Three birds were collected there, two adult males on June 12 and 17, respectively, and a juvenile male on June 13 (Nos. 20789-20791). An adult male (No. 30469) was taken in a similar wash below Madera Cañon on October 12, and others were seen.

152. **Heleodytes brunneicapillus couesi** (Sharpe)

Not seen by us in Sonoita Valley, where there is but little cactus suitable for the nesting sites that this bird prefers. On the Santa Rita Range Reserve it is an abundant species. Nests with small young were found there during the first week in June, and full-grown young were flying about

at the same time. Late in June birds were seen at work upon newly constructed nests, but these may have been built merely as resting places, and not necessarily for the reception of eggs. Cactus Wrens sometimes use nests thus throughout the year. Six specimens of Cactus Wren were preserved, four adults and two juveniles (Nos. 29702-29706, 30470).

153. **Salpinctes obsoletus obsoletus** (Say)

Seen occasionally in the spring in the vicinity of Patagonia and also at the west base of the Santa Ritas, but not common in either place. Abundant in lower Madera Cañon in September. Eight specimens collected (Nos. 30471-30477, 30234).

154. **Catherpes mexicanus conspersus** Ridgway

One specimen, an adult male (No. 29797), was collected near our camp on the Ashburn Ranch, May 16, and others were heard singing in Temporal Cañon, near by. A pair of Cañon Wrens had a nest in a shed at the Florida Ranger Station. One was collected in Madera Cañon on October 4 (No. 30484). The species is of general distribution in suitable places in southern Arizona.

155. **Thryomanes bewickii eremophilus** Oberholser

Found near Patagonia in the live oaks and underbrush of the rocky hills bordering the valley, where full-grown young were seen during the last week in May. Not abundant, and even less numerous in June at the western base of the mountains. Common in Madera Cañon, however, in September. Fourteen specimens collected (Nos. 29798-29803, 30235, 30236, 30478-30483).

156. **Troglodytes aëdon parkmanii** Audubon

Breeds in the mountains at a higher altitude than that at which most of our work was done, moving down after the breeding season to the foothills and valleys. Fairly

common in lower Madera Cañon throughout September. Six specimens collected (Nos. 29804, 30237, 30485-30488).

157. Sitta carolinensis nelsoni Mearns

A few of these nuthatches, the breeding season apparently over, appeared at the lower level of the oaks on the hills bordering the Sonoita Valley, during the third week in May. Others were seen there in September and in Madera Cañon in October. Eight specimens in all were collected, including two juveniles taken on May 26 (Nos. 29805-29807, 30238-30240, 30489).

158. Bæolophus wollweberi annexus (Cassin)

A common resident of the live-oak belt in the Santa Ritas, as in the other mountain ranges of southern Arizona. In the vicinity of Patagonia a few individuals appeared from time to time in the oaks on the surrounding hills. Abundant in Madera Cañon in the fall. The post-juvenal molt of young birds, and annual molt of adults, are not completely over until nearly the end of September. Sixteen specimens were collected (Nos. 29808-29810, 30241-30245, 30490-30498).

159. Psaltriparus plumbeus (Baird)

Another Upper Sonoran species that barely extends down to the floor of the Sonoita Valley, where but few were seen. As early as May 12, Lead-colored Bush-tits were seen in flocks, as though the nesting period was quite over. Ten specimens were collected, two adults and five young near Patagonia in May, and three molting birds in Madera Cañon, September 12 and 15 (Nos. 29811-29817, 30499-30501). The juveniles all had dark-colored eyes; in the adults the eye was white.

160. Auriparus flaviceps flaviceps (Sundevall)

A common desert species of general distribution in the lowlands of southern Arizona. A nest with two eggs was found in Temporal Cañon, May 20. Abundant in and

below Madera Cañon in September and October, ascending up to 4800 feet. Fourteen specimens were preserved (Nos. 29818, 29819, 30502-30512, 30514).

161. **Regulus calendula calendula** (Linnæus)

Seen near Patagonia during the first week in October. One collected in Madera Cañon on October 11 (No. 30513).

162. **Polioptila cærulea amœnissima** Grinnell

An Upper Sonoran zone species that we saw in small numbers in the foothill country bordering the Sonoita Valley and at the western base of the Santa Ritas. One specimen collected at Patagonia, September 22, and five in Madera Cañon, September 7 to 21 (Nos. 30244, 30515-30519). For use of the name *amœnissima* see Grinnell, 1926, p. 494.

163. **Polioptila melanura melanura** Lawrence

In small numbers at the western base of the Santa Rita Mountains, in the chaparral of the Santa Rita Range Reserve. For the use of the name *melanura* see Penard, 1923, p. 335, and Grinnell, 1926, p. 496.

164. **Hylocichla ustulata ustulata** (Nuttall)

A few migrating Russet-backed Thrushes were seen near Patagonia, the last on May 30. Of three birds collected (Nos. 29820, 29821) two are so nearly intermediate in appearance between *ustulata* and *swainsoni* as to make them difficult to place. I have collected other specimens of the same nature in Arizona. The occurrence of such indeterminate specimens is, perhaps, an answer to the query raised by Van Rossem (1925, p. 37), who suggests that there is possibly specific difference between *ustulata* and *swainsoni*.

Check-List of the Mammals

1. *Myotis velifer velifer* (Allen)
2. *Myotis californicus californicus* (Audubon & Bachman)
3. *Myotis thysanodes thysanodes* Miller
4. *Corynorhinus rafinesquii pallescens* Miller
5. *Antrozous pallidus pallidus* (Le Conte)
6. *Spilogale ambigua* Mearns
7. *Mephitis estor* Merriam
8. *Urocyon cinereoargenteus scottii* Mearns
9. *Otospermophilus grammurus grammurus* (Say)
10. *Citellus spilosoma canescens* (Merriam)
11. *Citellus tereticaudus neglectus* (Merriam)
12. *Ammospermophilus harrisii* (Audubon & Bachman)
13. *Thomomys fulvus toltecus* Allen
14. *Thomomys fulvus intermedius* Mearns
15. *Perognathus flavus flavus* Baird
16. *Perognathus amplus* Osgood
17. *Perognathus baileyi baileyi* Merriam
18. *Perognathus penicillatus pricei* Allen
19. *Dipodomys spectabilis spectabilis* Merriam
20. *Dipodomys merriami merriami* Mearns
21. *Dipodomys merriami olivaceus* Swarth
22. *Dipodomys ordii ordii* Woodhouse
23. *Onychomys torridus torridus* (Coues)
24. *Reithrodontomys megalotis megalotis* (Baird)
25. *Peromyscus eremicus eremicus* (Baird)
26. *Peromyscus maniculatus sonoriensis* (Le Conte)
27. *Peromyscus leucopus arizonæ* (Allen)
28. *Peromyscus boylii rowleyi* (Allen)
29. *Sigmodon hispidus cienegæ* A. B. Howell
30. *Neotoma albigula albigula* Hartley
31. *Mus musculus musculus* Linnæus
32. *Lepus alleni alleni* Mearns
33. *Lepus californicus eremicus* Allen
34. *Sylvilagus auduboni arizonæ* (Allen)

General Accounts of the Mammals

1. Myotis velifer velifer (J. A. Allen)

Four specimens collected (Nos. 5963-5966), all females and all from the same tunnel (McCleary's mine, altitude about 5000 feet), from which specimens of *Myotis t. thysanodes* and *Corynorhinus r. pallescens* were also taken. One was collected on September 27, and three on October 1.

2. Myotis californicus californicus (Audubon & Bachman)

One specimen (No. 5967) collected in Madera Cañon, altitude 4800 feet, on October 6. In the treatment accorded the subspecies of *Myotis californicus* by Miller & Allen (1928, p. 148, map 11), it will be noted that the dividing line drawn between the forms *californicus* and *pallidus* in southern Arizona accords with that separating the Western Desert Area and the Eastern Plains Area.

3. Myotis thysanodes thysanodes Miller

Seven specimens collected (Nos. 5956-5962). These are all males and were all taken at the same place, in a mining tunnel (McCleary's mine), at about 5000 feet altitude in

Madera Cañon, one on September 27, three on October 1, and three on October 9.

4. Corynorhinus rafinesquii pallescens Miller

Three specimens collected. No. 5687, female, was taken in a cave in a limestone ledge bordering the Sonoita, seven miles north of Patagonia, on May 23. It contained one fetus. Nos. 5954, 5955, males, were found in a tunnel (the McCleary mine), in Madera Cañon at about 5000 feet elevation, on September 27. In the rocky ledge along the Sonoita there are series of caves, large and small, which, apparently, are occupied at some time of the year by a large number of bats. Our investigations in May disclosed very few, not more than six or eight individuals all told. These few bats were active and alert, departing at the first indication of danger.

5. Antrozous pallidus pallidus (Le Conte)

The adobe cabin that we occupied on the Ashburn Ranch evidently sheltered a number of bats, between the walls and under the roof. Several Pallid Bats were caught on May 23 and 24, as they issued from crevices in the walls at dusk, and two, both females, were preserved (Nos. 5688-5689). Two more, male and female, respectively, were collected at the same place on August 29 (Nos. 5941-5942).

6. Spilogale ambigua Mearns

An adult male (No. 5948) was trapped in Madera Cañon, altitude 5200 feet, on September 30.

7. Mephitis estor Merriam

An adult female (No. 5910) was trapped near the mouth of Stone Cabin Cañon, June 9.

8. **Urocyon cinereoargenteus scottii** Mearns

Gray Foxes are fairly common in the Arizona mountains, extending down into the lowest foothills. One specimen, an adult female (No. 5911), was obtained by our party, trapped near our camp on the Ashburn ranch, seven miles north of Patagonia, on May 21.

9. **Otospermophilus grammurus grammurus** (Say)

An Upper Sonoran species that descends into Sonoita Valley at a few points. We saw ground squirrels occasionally along a rocky ledge bordering the bed of the Sonoita near the Ashburn ranch house, and four specimens (Nos. 5893-5896), adults in rather worn pelage, were collected there in May. Seen at about 5200 feet elevation in Madera Cañon.

10. **Citellus spilosoma canescens** (Merriam)

A small colony was found on the grounds about the old buildings of Fort Crittenden, where the animals were using, in part at least, burrows of *Dipodomys spectabilis*. Two specimens, adult females, were trapped there on June 1 and September 16, respectively (Nos. 5892, 5940), and a young male (No. 5939) was shot at a nearby locality, near Sonoita, on September 7. I was told that the species occurred in small numbers on the west side of the Santa Ritas, toward the north end of the range, but we saw none there ourselves. From the Santa Ritas eastward this species entirely replaces *Citellus tereticaudus neglectus* (see Mearns, 1907, p. 337), which in some respects it closely resembles. I have found it at various scattered points in southeastern Arizona, but never in any such numbers as *neglectus* attains to the westward. *Canescens*, moreover (and the same holds true of *obsidianus*, the only other subspecies of this species with which I am acquainted), is far more wary and retiring than the races of *tereticaudus*, so that even when present in fair abundance it may be overlooked.

11. Citellus tereticaudus neglectus (Merriam)

A common species on the desert plains from the Santa Rita Mountains westward, though by no means of general distribution. We found colonies along the road leading from Madera Cañon to Helvetia, covering circumscribed areas a few miles below the base of the mountains. Seven specimens (Nos. 5885-5891) were collected there on June 10 and 14, all scantily haired and nearly all in process of pelage renewal.

On June 10, Gorsuch, walking through a *Citellus* colony, caught sight of the tail of a Gila Monster (*Heloderma suspectum*) in one of the burrows, and, as he watched, the reptile slowly backed out. About its mouth *Citellus* hair adhered and when the lizard was killed and opened a spermophile was found in its stomach, swallowed entire, head first. Snakes, from their greater abundance, are probably a more serious menace, but from either of these enemies the spermophiles must be well-nigh helpless in a system of burrows that does not provide several outlets. In the colonies observed here the holes were in gravelly, hard-packed ground, and (though I made no excavations) I received the impression that the burrows were of rather simple construction. Some of the animals, however, were seen going in and out of kangaroo rat holes, in mounds that were honeycombed with runways, where doubtless they were in greater safety.

Round-tailed Spermophiles were occasionally seen in mesquite trees, ten or fifteen feet from the ground. I saw one, surprised in such a situation by one of our party who walked below without seeing the animal, that remained quietly aloft until the danger had passed, when it descended to the ground and to its nearby burrow.

12. Ammospermophilus harrisii (Audubon & Bachman)

Abundant on the Santa Rita Range Reserve, as it is over much of the lowlands of Arizona west of that point. As far as I know, the species does not occur along the Arizona-Mexico boundary line east of the Santa Rita Mountains. We did not see it in the Sonoita Valley, I never saw it in

previous years collecting in southern Cochise County, and Mearns (1907, p. 304-305) comments upon its absence from that section. Its range, then, in southern Arizona extends from the Colorado River east to the west base of the Santa Ritas. Farther north in the state, probably from the base of the Mogollon escarpment south about to the latitude of Fort Bowie, it extends eastward into New Mexico.

The local distribution of this and the other small ground squirrels (*Ammospermophilus* and *Citellus*) of Arizona presents various peculiar features. Although it is not unusual to find two species in the same locality, still, as a rule, they are segregated, and some one species, is, invariably, I believe, greatly in preponderance at any one place. Thus, in the section where we were working *Ammospermophilus harrisii* was abundant over the greater part of the slope extending from Madera and Sawmill cañons down to the Santa Cruz River. Some miles north of the mouth of Sawmill Cañon there are large colonies of *Citellus tereticaudus neglectus*, where very few of *A. harrisii* were seen. Between Tucson and the Santa Catalina Mountains, some years ago, I found the *Citellus* abundant, to the absolute exclusion of the *Ammospermophilus*. I have not been able in the places indicated to correlate the presence or absence of these species with soil conditions, as described by Grinnell (1914, pp. 219, 224) from the valley of the Colorado River. Nowhere in this general region are there areas of wind-drifted sand, such as Grinnell describes as the preferred habitat of *tereticaudus*. The ground is almost uniformly hard and gravelly except in the river bottoms, and there no spermophiles were seen.

Ammospermophilus harrisii is a diurnal animal, active throughout the day, and, when present, conspicuously in view. In trapping in the region where this ground squirrel occurs I lost a large proportion of small mammals, destroyed in the traps, and came to the conclusion that *harrisii* must be responsible. The specimens were mutilated through being nibbled at, the leg bones of a rat or mouse being left attached to the everted skin, so the damage must have been done by a small-sized animal. As specimens of *Ammospermophilus* were found thus eaten in the traps

when I knew that they had been trapped during the day, it was evident that a diurnal species was at least partly responsible. The damage was most frequently inflicted where *Ammospermophilus* was abundant, so altogether I am inclined to lay the blame on that species. Mearns (1907, p. 305) comments upon the carnivorous habits of this ground squirrel.

Ammospermophilus harrisii saxicola was described by Mearns (1896, p. 444; 1907, p. 306) from southwestern Arizona, as distinct from *A. h. harrisii* of the region where we collected. I have compared the fourteen adults we collected on the Santa Rita Range Reserve (see table, p. 352) with a series of twenty-four comparable adults from the lower Colorado River, in the Museum of Vertebrate Zoology and am unable to appreciate the color differences described by Mearns. Neither do I find such differences in measurements as Mearns ascribes to the two forms (see table, p. 352, and compare with tables given by Mearns [1907, pp. 307-309], and by Grinnell [1914, p. 220]). Consequently I agree with Grinnell (*loc. cit.*) in the conclusion that *Ammospermophilus harrisii salicicola* Mearns is not deserving of recognition.

13. **Thomomys fulvus toltecus** Allen

14. **Thomomys fulvus intermedius** Mearns

Pocket Gophers were abundant in the lowlands bordering the Sonoita. Throughout this portion of Arizona I think it is true that these animals in the lowlands are restricted to the vicinity of streams and to irrigated land adjoining, being entirely absent from the rocky foot-hills, the desert mesa, and the grassy plains. In the Patagonia section we found them only in the bottom lands. At the western base of the Santa Ritas no gopher sign was found anywhere on the Santa Rita Range Reserve or in the part of Stone Cabin Cañon where we were camped. In September, Miss McLellan found gophers in Madera Cañon, where five were trapped near the 5000-foot contour and workings seen up to about 7000 feet.

Measurements in millimeters of adult *Ammospermophilus harrisii* from the Santa Rita Range Reserve, Pima County, Arizona.

Collection	No.	Sex	Date	Total length	Tail vertebræ	Hind foot
C. A. S.	5873	♂	June 7, 1927	225	81	42
C. A. S.	5875	♂	June 8, 1927	255	91	41
C. A. S.	5884	♂	June 13, 1927	223	79	36
C. A. S.	5871	♀	June 5, 1927	233	80	40
C. A. S.	5872	♀	June 5, 1927	238	78	39
C. A. S.	5874	♀	June 7, 1927	226	80	39
C. A. S.	5870	♀	June 8, 1927	235	78	40
C. A. S.	5876	♀	June 8, 1927	246	83	43
C. A. S.	5877	♀	June 8, 1927	228	80	39
C. A. S.	5878	♀	June 8, 1927	232	80	40
C. A. S.	5880	♀	June 11, 1927	225	83	40
C. A. S.	5881	♀	June 15, 1927	223	83	41
C. A. S.	5882	♀	June 15, 1927	230	88	40
C. A. S.	5883	♀	June 13, 1927	225	80	36
			Average....	231.7	81.7	39.3

Bailey (1915) ascribes the gopher of the lowlands of this part of Arizona to *Thomomys fulvus toltecus*, that of the mountains to *T. f. intermedius*. Applying to our Patagonia series the characters ascribed to *toltecus*, and to the Madera Cañon specimens those of *intermedius*, I can follow him in this division. The Patagonia specimens, 28 in all (Nos. 5724-5751), are larger and duller brown. The five from Madera Cañon (Nos. 5949-5953) are smaller, richer brown, and black-backed.

Our specimens of *toltecus* were all taken in one pasture, seven miles north of the town of Patagonia, at about 4500 feet altitude, and on the border line between the Upper and Lower Sonoran zones. We saw no gopher sign in such purely Lower Sonoran localities as we visited, where conditions were evidently unfavorable to the species. Bailey (*loc. cit.*, p. 86) ascribes to *toltecus* a Lower Sonoran habitat, but it occurs also in some Upper Sonoran localities, as in the foothills of the Huachuca Mountains. There must be many such places where disconnected areas inhabited by *toltecus* are far more widely separated than are the habitats of *toltecus* and *intermedius*. In the Huachucas, for instance, there is practically continuous distribution of pocket gophers from the mountain tops down the cañons eastward to where they open upon the plains. Then there is a wide plains area devoid of these animals until the bottom lands of the San Pedro and Babocomari rivers are reached. As Bailey points out, the differences in subspecific characters occur as between specimens from the mountain tops and those from the mountains' base (between which there is essentially continuous distribution), while close resemblances exist between widely separated lowland distribution areas. It is a peculiarity in subspecific differentiation that is worthy of future study.

15. **Perognathus flavus flavus** Baird

Two specimens (Nos. 5787, 5788) were obtained, trapped near our camp at the mouth of Stone Cabin Cañon, on June 9 and 10, respectively. The trap line was laid along a north-facing slope, grass covered and with scattering

Measurements in millimeters of *Thomomys fulvus toltecus* and *T. f. intermedius*

Collection	No.	Sex	Locality	Date	Total length	Tail vertebræ	Hind foot
			Thomomys fulvus toltecus				
C. A. S.	5728	♂	Patagonia	May 15, 1927	229	69	30
C. A. S.	5733	♂	Patagonia	May 16, 1927	214	62	29
C. A. S.	5735	♂	Patagonia	May 17, 1927	225	72	31
C. A. S.	5736	♂	Patagonia	May 17, 1927	242	83	31
C. A. S.	5751	♂	Patagonia	May 20, 1927	229	64	28
			Thomomys fulvus intermedius				
C. A. S.	5951	♂	Madera Cañon, Sta. Rita Mts.	Sept. 29, 1927	190	62	24
C. A. S.	5952	♂	Madera Cañon, Sta. Rita Mts.	Sept. 30, 1927	200	65	27
C. A. S.	5953	♂	Madera Cañon, Sta. Rita Mts.	Sept. 30, 1927	205	67	27
			Thomomys fulvus toltecus				
C. A. S.	5724	♀	Patagonia	May 14, 1927	212	71	30
C. A. S.	5725	♀	Patagonia	May 14, 1927	202	60	28
C. A. S.	5727	♀	Patagonia	May 15, 1927	219	63	28
C. A. S.	5729	♀	Patagonia	May 15, 1927	205	57	29
C. A. S.	5731	♀	Patagonia	May 16, 1927	207	57	27
C. A. S.	5732	♀	Patagonia	May 16, 1927	206	60	28
C. A. S.	5737	♀	Patagonia	May 17, 1927	226	73	28
C. A. S.	5738	♀	Patagonia	May 18, 1927	212	69	29
C. A. S.	5739	♀	Patagonia	May 18, 1927	211	60	28
C. A. S.	5743	♀	Patagonia	May 19, 1927	204	60	29
			Thomomys fulvus intermedius				
C. A. S.	5949	♀	Madera Cañon, Sta. Rita Mts.	Sept. 27, 1927	182	57	25
C. A. S.	5950	♀	Madera Cañon, Sta. Rita Mts.	Sept. 28, 1927	163	52	25

oak trees. No other pocket mice were taken in this line, and this species of *Perognathus* was not otherwise found by us.

16. **Perognathus amplus** Osgood

Found only on the Santa Rita Range Reserve, where four were trapped, three on June 13, one on June 16 (Nos. 5783-5786). Two are adults, two in juvenal pelage. The first three secured were taken within a few hundred yards of each other, the fourth about a mile distant, in trap lines that were about five miles northwest of the Florida Ranger Station, and a mile or more from the base of the mountains.

17. **Perognathus baileyi baileyi** Merriam

A rather uncommon species in the section of the Santa Rita Range Reserve where we were trapping. Eight specimens (Nos. 5752-5759) were preserved and a few more discarded (damaged in the traps) from our trap lines there during June. Somewhat more abundant during October immediately below Madera Cañon, where 17 skins were obtained (Nos. 5970-5985, 6037). On the plains bordering the western base of the Santa Rita Mountains was the only place where we found the species. None was taken in the foothills and none east of the mountains. One was found in the stomach of a rattlesnake (*Crotalus atrox*).

18. **Perognathus penicillatus pricei** Allen

Eleven from the vicinity of Patagonia, twelve from the Santa Rita Range Reserve, and two from lower Madera Cañon (Nos. 5760-5782, 5968-5969). The species was decidedly rare in the Patagonia region, where the specimens preserved represent the entire catch for a month. At the western base of the mountains it was more numerous, and many more were caught than were preserved. No juveniles were taken at Patagonia, during May, but on the Santa Rita Range Reserve, during June, the young were as numerous as adults.

19. **Dipodomys spectabilis spectabilis** Merriam

A common species in the higher portion of the Santa Rita Range Reserve. Twenty-three specimens (Nos. 5848-5870) were trapped there during June, all adults. No young ones were seen or trapped, and none of the females collected contained embryos or was nursing. Three specimens (Nos. 5933-5935) were trapped at Fort Crittenden in September. The conspicuous mounds and other workings of the animal were not seen elsewhere on the east side of the Santa Ritas, and it may be doubted that the species extends farther east in the near vicinity of the boundary line.

For life history and other information regarding this species, as observed in the exact section where we were working, see Vorhies and Taylor, 1922.

20. **Dipodomys merriami merriami** Mearns

Extremely abundant west of the Santa Rita Mountains, where it is of general distribution over the desert plains and up to the base of the mountains. Forty-six specimens (Nos. 5802-5847) were prepared during June, all from the Santa Rita Range Reserve, and many more trapped animals were discarded for various reasons.

21. **Dipodomys merriami olivaceus**, new subspecies

Type.—Male adult, skin and skull, No. 6235, Mus. Calif. Acad. Sci., collected by Sam Davidson (orig. No. 39), October 28, 1928, **Fairbank, Cochise County, Arizona.** Measurements of type: Total length 243.0 mm.; tail vertebræ, 141.0; hind foot 37.0; ear, 12.0. Skull: greatest length, 36.5 mm.; breadth of skull across bullæ, 23.0; spread of maxillary arches, 17.2; greatest length of nasals, 13.5; greatest width of rostrum near end, 3.2; width of maxillary arch at middle, 5.0.

Diagnosis.—A slightly differentiated race of *Dipodomys merriami*, varying from typical *D. m. merriami* in darker coloration and in slightly larger skull with appreciably higher brain case.

Material examined.—Three specimens from Fairbank, Arizona, in the collection of the California Academy of Sciences; ten specimens from Fairbank, Arizona, in the Stanford University collection; nine specimens from Fairbank, Arizona, and three from the east base of the Huachuca Mountains, Arizona, in the collection of the Field Museum of Natural History.

Remarks.—We collected no specimens of four-toed kangaroo rats east of the Santa Rita Mountains. I knew, however, that the species occurred in that general region, having collected some, years before, at the east base of the Huachuca Mountains, and the manner of occurrence there, in comparison with conditions west of the Santa Ritas, made it seem desirable to make close comparison of specimens from the two regions. We had abundant material from the western area, but none from the eastern. To aid us in supplying this need, Mr. Sam Davidson, of Palo Alto, California, who was in Tucson temporarily, made a trip to Fairbank, where he trapped three specimens on October 27 and 28, 1928. I was also able to borrow specimens from the Stanford University collection and from the Field Museum of Natural History, as above indicated.

From the western base of the Santa Rita Mountains westward throughout the lowlands of southwestern Arizona (the Western Desert Area), *D. m. merriami* is one of the most common, perhaps the commonest, small mammal. In the Eastern Plains Area kangaroo rats are rare, occurring in small colonies at widely scattered intervals. Apparently open grass land is not suited to their needs, for they usually occur in sandy washes, where soft ground and low scattered bushes afford more congenial surroundings.

Examination of specimens shows the presence of certain slight differentiating characters that can be associated with animals from the two regions. Of these features color is the most outstanding.

Olivaceus is relatively dark colored, more olivaceous, as compared with the bright reddish hue of typical *merriami*, a difference that shows strongly in comparing series from the nearby localities of Fairbank and the Santa Rita Range Reserve. *Merriami* is markedly variable in colora-

tion, as pointed out by Grinnell (1922, p. 74), but the Fairbank specimens stand outside the limits of variation in any series of *merriami* examined from western Arizona or southeastern California. Coloration of *olivaceus* is practically indistinguishable from that of *Dipodomys ordii ordii*, which occurs together with *olivaceus* in southern Arizona. In fact, a specimen of *ordii*, labelled *merriami*, was found among the borrowed skins. In the skull, the slightly greater general size and higher brain case of *olivaceus* are average characters that hold fairly well, though there is overlapping between the two forms in these regards.

Once the peculiar features of the Fairbank specimens were appreciated, the possibility suggested itself of their being the same as the form *Dipodomys ambiguus* Merriam (1890, p. 42), described from El Paso, Texas, and later regarded as a subspecies of *D. merriami*. A series of "*ambiguus*" was loaned me by the United States Biological Survey, with the added information that that form was now considered by mammalogists of the Survey as indistinguishable from typical *merriami*. With this opinion I can concur, as the El Paso specimens in the series are indistinguishable from my series from the Tucson region. The series of "*ambiguus*," however, includes two skins from Jarilla, New Mexico, and one of these is exactly like *olivaceus* in color. Whether or not this indicates intergradation between the two forms in that region I can not say; no such close resemblance appears in any series from points west of the Santa Rita Mountains.

I wish to emphasize the fact that *olivaceus* is not a strongly marked form. It is admittedly a faintly indicated subspecies, of average heavier build and darker coloration than *merriami* in about the same degree, as at the western edge of the *merriami* habitat, the variant *simiolus* is slightly smaller and paler colored. As these differences do exist, however, and, moreover, as they can be correlated with markedly different physical surroundings and living conditions, it seems to me desirable to have names for each of the forms concerned.

That the El Paso specimens should prove to be the same as those from Tucson is probably an indication of con-

tinuous distribution of *merriami* between the two points through a belt to the northward of the habitat of *olivaceus*.

After the above account was written there was published the description by Goldman (1928, p. 141) of *Dipodomys merriami mayensis*, from southern Sonora, Mexico, which is also described as a dark colored form. The possibility suggested itself, of course, of *mayensis* and *olivaceus* being synonymous, but, although I have not made direct comparison of specimens, the skull characters of *mayensis* that are emphasized by Goldman and demonstrated in his measurements are not features of *olivaceus*. *Mayensis* appears to be a different, and probably a more strongly marked, subspecies.

22. **Dipodomys ordii ordii** Woodhouse

Present in small numbers in the Sonoita Valley. Thirteen specimens (Nos. 5789-5801) were trapped between May 16 and 30, all in rather sandy bottom lands bordering the Sonoita River, a few miles north of Patagonia. The series includes three half-grown young, collected on May 27 and 29.

23. **Onychomys torridus torridus** Coues

Not common in the Sonoita Valley. Trap lines in a section of the bottom lands where the soil was rather light and sandy produced six specimens in about two weeks. Other trap lines where conditions were different did not catch any. West of the mountains, on the Santa Rita Range Reserve, the species was far more abundant, and some were caught almost every night. Thirty-seven specimens in all were preserved, six from the vicinity of Patagonia (Nos. 5652-5657), twenty-two from the Santa Rita Range Reserve (Nos. 5658-5679), and nine from below the mouth of Madera Cañon (Nos. 5986-5992, 6032).

Another species, *Onychomys leucogaster ruidosæ*, occurs east of the Santa Ritas, as at Fairbank (Hollister, 1914, p. 448), but we failed to find it and have no data showing whether or not the two species occur over precisely the same ground.

Measurements in millimeters (average, minimum and maximum) of *Dipodomys merriami merriami* and *D. m. olivaceus*

No. of specimens	Locality	Greatest length of skull	Breadth of skull across bullæ	Spread of maxillary arches	Greatest length of nasals	Greatest width of rostrum near end	Width of maxillary arch at middle
10[1]	Fairbank, Arizona.....	36.9 (36.0-37.5)	23.2 (23.0-23.5)	17.0 (16.5-18.0)	13.4 (13.0-14.0)	3.1 (3.0-3.2)	5.1 (5.0-5.5)
10[2]	Santa Rita Range Reserve, Ariz.	35.9 (35.0-36.0)	22.6 (22.0-23.0)	16.1 (16.0-16.5)	13.0 (12.0-14.5)	3.1 (3.0-3.2)	4.9 (4.5-5.2)
10[3]	El Paso, Texas (8), and Jarillo, New Mexico (2).....	35.3 (34.5-36.0)	22.7 (22.0-23.2)	16.7 (16.0-17.2)	12.4 (12.0-13.0)	3.0	4.8 (4.2-5.0)

[1]Coll. Stanford University, 5; coll. Field Museum of Natural History, 5. Nine males, one female.

[2]Ten males.

[3]Coll. U. S. Biological Survey. Six males, four females.

Measurements in millimeters (average, minimum and maximum) of *Dipodomys merriami merriami* and *D. m. olivaceus*

No. of specimens	Locality	Total length	Tail vertebræ	Hind foot	Ear	Ratio percent length of tail to total length
10[1]	Fairbank, Arizona.....	246.3 (232.0-256.0)	145.8 (135.0-157.0)	37.2 (35.0-40.0)	10.7 (9.0-14.0)	59.1 (57.0-62.0)
10[2]	Santa Rita Range Reserve, Ariz.....	243.6 (231.0-268.0)	142.7 (133.0-160.0)	37.2 (36.0-38.0)	9.9 (7.0-11.0)	58.4 (57.0-61.0)
10[3]	El Paso, Texas (8), and Jarillo, New Mexico (2)..	245.7 (236.0-252.0)[4]	145.7 (140.0-152.0)[4]	38.6 (36.0-40.0)	.....	59.7 (57.0-62.0)[4]

[1]Coll. Stanford University, 8; coll. Field Museum of Natural History, 2. Nine males, one female.

[2]Ten males.

[3]Coll. U. S. Biological Survey. Six males, four females.

[4]Nine specimens.

24. Reithrodontomys megalotis megalotis (Baird)

Evidently rather rare throughout the region. Four were trapped near Patagonia, on May 15, 18, 19, and 28, respectively, and three of them preserved (Nos. 5639, 5684, 5685). One was caught at the mouth of Stone Cabin Cañon, June 11 (No. 5683).

25. Peromyscus eremicus eremicus (Baird)

Eleven specimens collected: One from near Patagonia, and ten from the foothills at the western base of the Santa Rita Mountains (Nos. 5628-5635, 5641, 6017, 6018). The Patagonia specimen (from a trap line that produced *P. l. arizonæ* and *P. m. sonoriensis*) was the only example of this mouse that we caught in that region. At the western base of the mountains *eremicus* was found mostly in rocky places in the lowest foothills. Only one or two were caught on the Santa Rita Range Reserve, and those on the bottoms of gulleys leading from the hills. No *Peromyscus* of any kind was caught on the level floor of the Range Reserve, where other species of rodents were decidedly abundant.

26. Peromyscus maniculatus sonoriensis (Le Conte)

Four specimens (Nos. 5647-5649, 5651) were trapped in bottom lands adjoining the Sonoita River, some six miles north of Patagonia, in the same trap lines that were producing *Dipodomys*, *Perognathus*, and *Onychomys*. Not one was collected in all the trapping that was carried on at the western base of the Santa Ritas. I have not found the species to be common anywhere in southeastern Arizona.

27. Peromyscus leucopus arizonæ (Allen)

Seven specimens (Nos. 5638, 5640, 5642-5646) were collected near Patagonia, in the same trap lines that produced our few examples of *sonoriensis*. This was in sandy or gravelly bottom lands. None of this species was taken in the rocky localities that harbored *rowleyi*, nor was any collected on the west side of the Santa Ritas.

28. **Peromyscus boylii rowleyi** (Allen)

Abundant in the mountain ranges of southeastern Arizona, down to the lower limit of the Upper Sonoran zone; absent from the plains. Twenty-seven specimens preserved from the Patagonia region, 47 from the vicinity of the Florida Ranger Station, and from lower Madera Cañon (Nos. 5591-5627, 5636, 5637, 5650, 5994-6016, 6019-6026, 6029-6031). All taken at our Patagonia station were in rocky outcroppings bordering the Sonoita River, at the lower edge of the oak woods. None was found on the valley floor where other species of *Peromyscus* were trapped.

29. **Sigmodon hispidus cienegæ** A. B. Howell

Three cotton rats (Nos. 5680-5682) were taken near our camp seven miles north of Patagonia, on May 20, 21, and 23, respectively. One was found drowned in a ditch, the other two were caught in the same trap on a sandy stretch adjoining the Sonoita River bottom, far from water at that season, and where I had been trapping *Dipodomys* and *Perognathus*. Several piles of brush, like small, flattened, wood rat "houses" had attracted my attention there, but no wood rats were caught, and the traps were undisturbed after the cotton rats were captured. Two more were trapped on marshy ground bordering the Sonoita a short distance below Patagonia on September 21 and 23, respectively. These two were females, containing the one 12, the other 14, embryos!

I am applying to these specimens the name *Sigmodon hispidus cienegæ* A. B. Howell (1919, p. 161), at the suggestion of Major E. A. Goldman, and without myself making any study of the systematic status of the group. No less than five names are in use for cotton rats from different localities in southern and central Arizona, with few specimens available from any one place. The differences involved are mostly of size, and size has been shown by Grinnell (1914, p. 230) to vary so much in one of the races that some doubt may be felt as to the validity of at least some of the subspecies described.

30. **Neotoma albigula albigula** Hartley

Of common occurrence nearly everywhere in Upper and Lower Sonoran zones, but less numerous about Patagonia than on the west side of the mountains. On the Santa Rita Range Reserve wood rats were especially abundant, and their nests, often of great size, were conspicuous nearly everywhere in the chaparral. Many more specimens were trapped than could be skinned, but 39 were preserved, as follows: from Patagonia, 20 (Nos. 5690-5709), collected in May; from Stone Cabin Cañon and the adjacent Santa Rita Range Reserve, 14 (Nos. 5710-5723), collected in June; from lower Madera Cañon, 5 (Nos. 5943-5947), collected between September 23 and October 8.

A large proportion of the wood rats trapped were infested with larvæ of a species of bot-fly, huge grubs often nearly an inch long, lying just under the skin. These were most often found on the throat, where the rat seems powerless to dislodge them. Twelve of the 39 specimens preserved had grubs so located. They are mostly on animals taken during June. It was noticeable that the other rodents of the region were free of this sort of pest, which, however, was also common on rabbits.

31. **Mus musculus musculus** Linnæus

One was trapped in brush land, some distance from any houses, near Patagonia on May 27 (No. 5683).

32. **Lepus alleni alleni** Mearns

Extremely abundant in the vicinity of Tucson. The distribution of this species in Arizona is of more than ordinary interest, occurring as it does over a relatively restricted area, and having its range delimited by factors that are difficult to comprehend. As we travelled east in Arizona we found this hare rather abruptly plentiful at a point about one-third of the way from Florence to Tucson, which point in fact marks approximately the known western boundary of its range. On the Santa Rita Range Reserve it was so numerous that it was no uncommon occurrence

in the early morning for 12 or 15 of these hares to be in sight at once, fleeing at the approach of our auto along the road. The species occurs in small numbers in the Sonoita Valley, where we saw several within a few miles of Patagonia, but it is decidedly rare there and elsewhere along the east base of the Santa Rita Mountains, and does not occur at all in the open country still farther east.

In the original account of *Lepus alleni* (Mearns, 1890, p. 294), the habitat is said to lie "between Phoenix and Benson," a statement that has been repeated in other publications. I doubt if it extends quite as far northwestward as Phoenix, and it certainly does not reach as far east as Benson. The vicinity of Pantano, about 20 miles west of Benson, marks the eastern boundary of the species. Minor corrections of range of this sort may appear unimportant, but in this and some other desert species of the same region there is significance in their distribution that will be understood eventually only by close attention to just such details.

A subspecies of *Lepus californicus* (*L. c. eremicus*) occurs about the Tucson region in company with *alleni* and in about equal numbers. We saw them together repeatedly on the Santa Rita Range Reserve, sometimes sitting under the same bush or running away side by side. The species *Lepus californicus*, however, occurs uninterruptedly across the desert plains of southern Arizona, from the Colorado River to New Mexico. The dividing line between two subspecies of this species, *eremicus* and *deserticola*, lies somewhere near the western limit of *L. alleni*, but this is the only coincidence between any boundaries of the two species and it is doubtful if there is any real correlation there. It is difficult to imagine the factors that delimit the range of one species of jack rabbit and permit the other to pass unhindered, but that there are such factors must be realized by anyone noting the sharp delimitation of the one species, *alleni*, within the wider habitat of the other, *californicus*.

Lepus alleni is placed by Nelson (1909, p. 115) in the *Lepus callotis* group, or white-sided jack rabbits, the members of which have a peculiar habit of flashing the white markings on their haunches from one side to the other as

they flee from pursuit. This habit is described and figured by Nelson (*loc. cit.*, p. 115, pl. 1), as observed in *Lepus callotis*, in terms that do not entirely accord with my own observations upon *L. alleni*. In the text and on the plate cited the changing white area is described and figured as on the sides and flanks of the animal. My own observations (made with the above account fresh in my mind) were of an animal on which the white area covered the entire rump and extended forward barely to include the flanks.

On rabbits seen at close range, quiet and not alarmed, the white hardly shows at all. The white hairs are dark-tipped and in the smooth-lying pelage the white is hidden. Evidently it is flashed into view by a twitching of the skin, as described by Nelson, that raises the white hairs conspicuously. As the startled jack rabbit departs it is usually quartering, rarely going straight away from the observer, and always the haunch in view shows a flash of white. As it bounds along it turns constantly, exposing sometimes one flank, sometimes the other, the white area shifting with every turn, but not extending forward beyond the haunches. The black dorsal line of the tail is always conspicuous against the white rump, pointing straight down when the animal is at rest. When the left haunch is presented, conspicuously white, the tail is pulled over, pointing sharply to the left; with the right haunch flaring white the tail points to that side. Apparently the skin on one side or the other is drawn taut by the same action that pulls the tail to left or right, as the case may be. It all goes so quickly as to be obviously automatic.

Another peculiar habit of *Lepus alleni* is, as it starts to run, to make four or five long hops on the hind legs alone, kangaroo fashion, without touching the fore-feet to the ground, and then to settle down to the ordinary mode of locomotion. Occasionally, with ears keenly erect, the kangaroo hops are again resorted to in flight, to get sight or sound of possible pursuers. This is something that I have never observed in any other species of rabbit, but it is the usual thing with *alleni*.

We collected five specimens of *Lepus alleni:* A half-grown female, May 14, and an adult male, May 19, near Patagonia; an adult male and two adult females on the Santa

Rita Range Reserve, collected on June 6, 8, and 16, respectively (Nos. 5902, 5903, 5906-5908).

33. **Lepus californicus eremicus** Allen

In great numbers on the Santa Rita Range Reserve and elsewhere on the desert plains west of the Santa Ritas. Decidedly rare in the Sonoita Valley, east of the mountains, but occurring throughout this region and over the plains to the eastward. Throughout the lowlands of extreme southeastern Arizona there is lack of cover, and jack rabbits are scarce accordingly, but patches of sacaton grass shelter a few, and others may occasionally be jumped from most bare and unpromising situations. There is no break in the east and west distribution of this jack rabbit, though it exists in much smaller numbers on the southeastern grassy plains than on the southwestern deserts. Three specimens were preserved, all adult males collected during May within seven miles of Patagonia (Nos. 5904, 5905, 5909).

34. **Sylvilagus auduboni arizonæ** (Allen)

In abundance over the lowlands west of the Santa Rita Mountains. East of the mountains it was relatively scarce, being influenced by lack of shelter on the grassy plains just as the jack rabbit is, though as a smaller animal it can take advantage of more hiding places. I have found cottontails on the open plains sheltered under dessicated carcasses of cattle, the dried skin over the bones being all that was left, and this forming a very acceptable haven. Five specimens were preserved, four from the vicinity of Patagonia in May, one from the Santa Rita Range Reserve in June (Nos. 5897-5901).

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PLATE 27

Fig. 1. Western foothills of the Santa Rita Mountains; in the distance is Elephant Head, a rocky pinnacle near the southern end of the range. Scattered live-oaks clothe the foothills, especially on north-facing slopes, down to the edge of the plains. Photo taken in June, 1927.

Fig. 2. Santa Rita Range Reserve below Sawmill Cañon. There are places immediately below the western foothills where limited areas on the plains are relatively free of brush, grass covered, and with a sparse growth of small mesquites. Photo taken in June, 1927.

Fig. 1

Fig. 2

Plate 28

Fig. 1. Santa Rita Range Reserve. The vegetation here shown is of the type that is prevalent over the lowlands of this region, with cactus of several species conspicuous everywhere. This is the habitat of such birds as Palmer Thrasher, Cactus Wren, Gambel Quail, and Black-throated Sparrow; of such mammals as jack rabbits and cotton-tails, Harris Ground Squirrel, kangaroo rats, pocket mice, and grasshopper mice. Photograph taken in June, 1927.

Fig. 2. The giant cactus is conspicuous over some parts of the plains but it is not of general distribution. There is a long list of bird species that nest by preference in woodpecker holes in the cactus, and there are some of these birds that in Arizona rarely occur far from this plant. Some species of widely diverse character that are closely associated with the giant cactus are the Elf Owl, Gilded Flicker and Arizona Crested Flycatcher. Photo taken thirty miles west of Tucson, June 21, 1927.

Fig. 1

Fig. 2

Plate 29

Fig. 1. Sonoita Valley between Patagonia and Fort Crittenden; the Santa Rita Mountains in the distance to the westward. The low foothills here shown support a sparse growth of scrubby live-oaks (mostly on north facing slopes), with little or no underbrush. The ground is green with grass after the rains, but at the time when this photograph was taken it was bare and parched, well-nigh denuded of grass by grazing cattle. Photo taken in May, 1927.

Fig. 2. In some parts of the eastern foothills yuccas cover large areas in almost pure stands. They form the favorite haunt of the Scott Oriole. Photo taken May 28, 1927.

Fig. 1

Fig. 2

PLATE 30

Fig. 1. The western edge of the San Rafael Plains, twenty miles east of Patagonia; the Santa Rita Mountains in the distance, to the westward. It is about at this point that the last rolling foothills merge into the open plains. Photo taken in September, 1927.

Fig. 2. The San Rafael Plains. From this point eastward the lowlands are mostly open prairie, destitute of any vegetation but grass. There are occasional small tracts of brush land, and along the washes there are a few cottonwoods, willows and other trees. These plains are the habitat of the Swainson Hawk, White-necked Raven, Texas Meadowlark, and Scorched Horned Lark. In migration they are occupied by Chestnut-collared and McCown longspurs, and by Baird, Savannah, and Western Vesper sparrows. Photo taken in September, 1927.

Fig.1

Fig.2

Plate 31

Fig. 1. Mound and burrows of *Dipodomys spectabilis*. Other small mammals were constantly caught in traps set about these mounds, such as *Dipodomys merriami*, *Ammospermophilus harrisii*, and species of *Perognathus*. There seemed to be very few individuals of *Dipodomys spectabilis* in any one mound, and the elaborate systems of runways were entered freely by other species. Photo taken on the Santa Rita Range Reserve, June, 1927.

Fig. 2. Travertine rock bordering the Sonoita River near Patagonia, showing the entrances of caves, some of which extended to great depths. They were inhabited by several species of bats, by the Rock Squirrel (*Otospermophilus grammurus*), by Wood Rats (*Neotoma albigula*), and by an occasional Horned Owl (*Bubo virginianus pallescens*). Photo taken in May, 1927.

Fig. 1

Fig. 2

PLATE 32

Fig. 1. The Sonoita River, flowing along the eastern foothills of the Santa Rita Mountains, is bordered by rows of tall cottonwoods, sycamores, and willows, with, in many places, dense thickets of lower growing shrubbery below. In such surroundings are found Arkansas and Cassin kingbirds, Vermilion Flycatcher, Cooper Tanager, Bullock and Arizona Hooded orioles, Sonora Yellow Warbler, and Lucy Warbler. Photo taken seven miles north of Patagonia, May, 1927.

Fig. 2. The crumbling walls of some of the adobe buildings comprising old Camp Crittenden; Santa Rita Mountains in the distance. It was here that H. W. Henshaw made an important collection of birds in 1874. On open ground between the buildings we found small colonies of *Citellus spilosoma canescens* and *Dipodomys spectabilis*. Photo taken May 30, 1927.

Fig. 1

Fig. 2